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MEADOW HAY.

H. G. Elliott,
Agricultural Adviser (Dairy Branch).

In the spring a task of major importance lies in using to the best advantage the surplus growth which is obtained from our pastures, and utmost attention should be given to the conservation of hay and/or silage to tide over the long summer drought and early winter periods when grass growth is limited.

If surplus spring growth is not properly managed and very little of it conserved, the whole of the feed available from the pastures will show a serious decline in quality and value. Silage and meadow hay are two excellent forms of conserving this surplus growth. It can be said that the amount of silage and hay usually made from the surplus growth from the pastures is less than could be fed, with economic results, to the stock carried; very often this position may be justified by circumstances but more frequently it cannot be justified especially on dairy farms.

In this State meadow hay can be made and stacked relatively cheaply providing modern methods are utilised, while silage can be stored in pits, stacks, or silos at a very small cost per ton. It must be remembered, however, that a good reserve of both hay and silage is an insurance against bad seasons and enables the farmer to increase the stock carrying capacity of his farm.

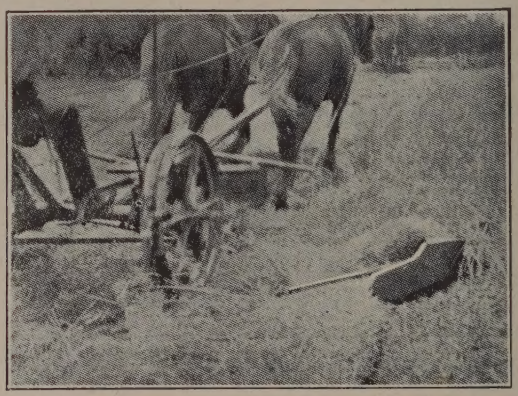
The following table shows that there has been only a very gradual increase in quantities of hay conserved per cow while the amount of silage conserved per cow has slightly decreased. These figures were obtained from the Better Dairying Competition which was conducted by this Department during the seasons 1931-32 to 1935-36.

	Reserve per Cow.									
	Hay.					Silage.				
	1935-36.	1934-35.	1933-34.	1932-33.	1931-32.	1935-36.	1934-35.	1933-34.	1932-33.	1931-32.
	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.
1.—Average all zones in wet districts	1·30	1·43	1·49	1·21	1·06	0·55	0·84	0·89	1·16	0·74
2.—Average Zone 6 (Narrogin)	6·03	4·45	4·9	2·9	....	....	3·25	2·8	3·3	....

1.—Receive 30in. to 60in. in Rainfall. 2.—Receive 17in. to 25in. in Rainfall.

Making Meadow Hay.

The value of meadow hay as a fodder for use, especially during the winter months, is gradually becoming a recognised fact for successful farming, and many farmers throughout the State are making a regular practice of keeping a portion of their pastures for this purpose.



Ryegrass and Subterranean Clover being cut with a Special Divider.
[*Block by courtesy of J. Leith Gillespie.*]

Clover hay making often appears simple, but skill is required to obtain the best product, particularly when the weather conditions are uncertain. The aim of every farmer should be to obtain the maximum quantity of material rich in digestible nutrients.

Time to Cut.

The correct time to cut a clover pasture is when the bulk of the plants are coming into flower. Do not wait until full flowering, otherwise some of the valuable constituents of the product will be lost.

This is shown clearly in the following table. 100 lbs. of dry matter contains:—

	Digestible Crude Protein.	Production Starch Equivalent.	Phosphoric Acid.
	%	%	ozs.
Young Pasture, 3in. to 5in. high ...	19	68	22·4
Hay stage Pasture (flowering) ...	10·8	44	9·6
Mature stage Pasture (dry)	4·5	30	6·4

From the above it will be seen that young clover is by far the best, but if cut too early the leaves are tender and the majority of them would be lost during the curing and carting operations, and apart from this, sufficient bulk would not be obtainable for hay. The right time to cut is when the bulk of the plants in the pasture are in the flowering stage. If cut later a rapid decrease takes place in the valuable food constituents and the hay is stemmy, relatively indigestible and some-

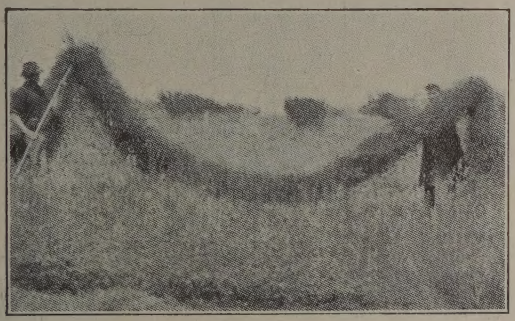
what unpalatable. It also must be remembered that late cutting weakens the root stocks of young perennial plants and prevents annual plants from making an aftermath of good grazing value.

CUTTING AND HANDLING.

A good mower with sharp knives, dividers, and a good swathing attachment is essential.

Leave each swath for a day or two to allow the exposed surface to dry sufficiently, after which it should be turned and left for a day to allow the other side to dry. After this operation the swathes are carefully put into windrows and then carted into the stack, avoiding, if possible, cocking. Careful handling is essential to prevent damage to, and loss of, the fine leaves. Given favourable weather conditions the hay should be in the stack on the third or fourth day after cutting.

Rain has a considerable damaging effect on hay, and every endeavour should be made to harvest in fine weather, even though it may mean an early or late cutting. It must be remembered, however, that while early cutting may mean reduced



A heavy crop of Subterranean Clover is difficult to handle.

[*Block by courtesy of J. Leith Gillespie.*]

weights of hay, it is offset to a great extent by increased aftermath growth. Late cutting means a loss in value of the product, also loss of leaf material. This is probably better than a crop cut at the right time and damaged by rain.

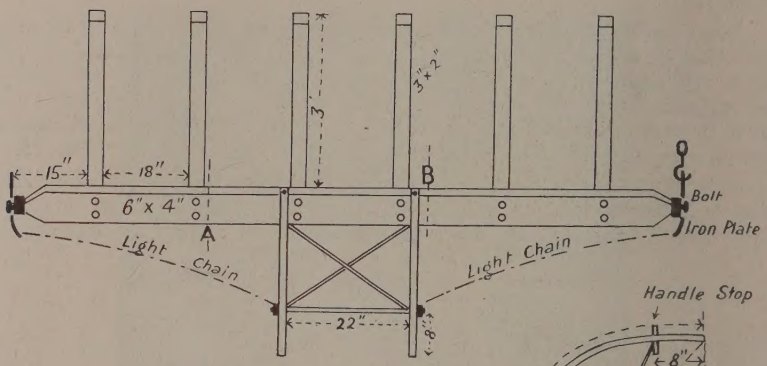
Often the work of loading hay on to drays or wagons may be considerably lightened by the use of the "Tumble Sweep" as illustrated on page 276. The load is picked up by the steel pointed teeth and is retained by the handles and two chains. The horse is hitched by leading chains to the ends of the frame.

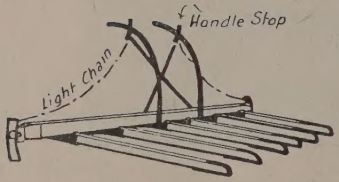
The following two illustrations show the tumble sweep operating and tipping. When tipping, lift the handles a little so that the points catch in the ground and the pull of the horse overturns the sweep. The stops on the handle of the tumble sweep grip the ground and the horse again pulls it over to sweeping position after the load has been dropped.

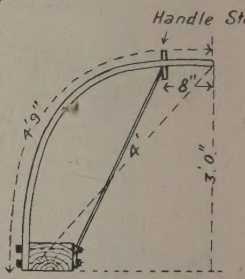
It will be found if this method is adopted that a remarkably large quantity of hay can be moved to a stack at one time. This sweep is inexpensive and a great labour saver.

Two-horse, truck, and tractor sweeps can be obtained and have been used with great success.

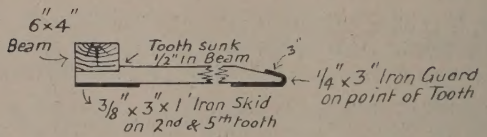
6 TOOTH ONE HORSE TUMBLE SWEEP







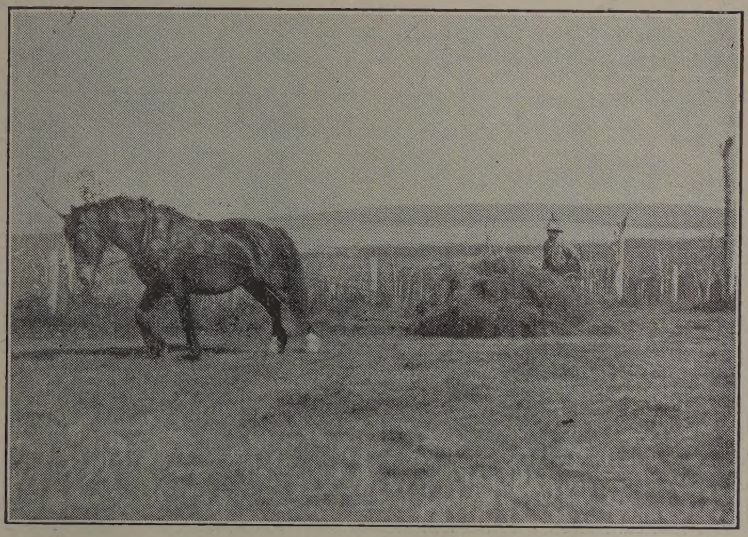
Showing Curve of Handle & Brace at Section "B"



Section at "A"

Legend. Plan of detail of One Horse Tumble Sweep

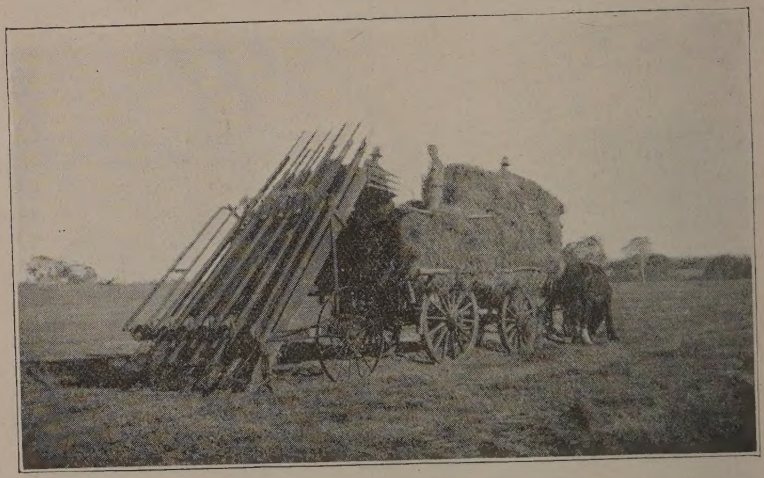
Timber Required: 1 only 6"x4"x 11.6" long
6 only 3"x2"x 3.6" long



One-horse Tumble Sweep being operated on farm of Messrs. Bayley Bros., Denmark.

Showing tumbling action of sweep, minimising handling the material.

When operating on a large scale side delivery rakes and hay loaders are invaluable for facilitating haymaking operations, and will save considerable expense in labour. The following two photographs show the side delivery rake and hay loader in operation on the property of Mr. A. Hardie, "Rosedale." Narrogin.



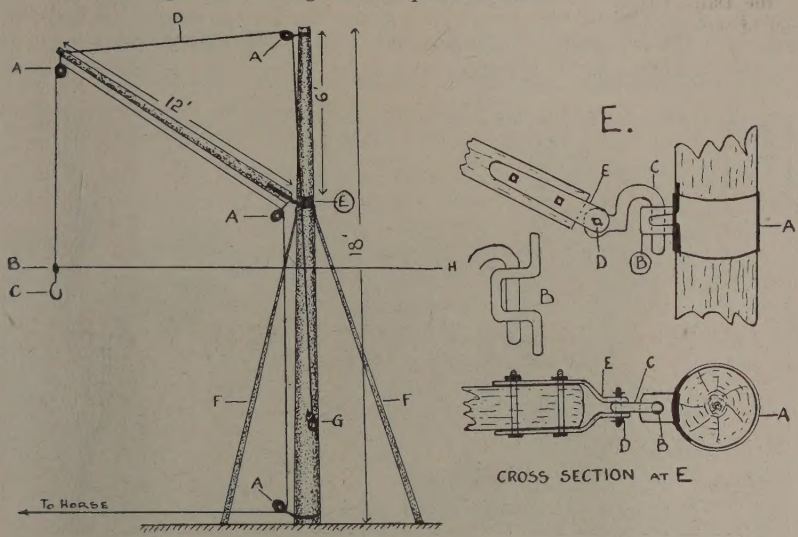
Stacking.

The material should be spread evenly over the stack and well tramped to avoid the formation of air pockets, in order to control fermentation and drying out.

Heat will be generated and charring produced if the material is too green or too damp when stacked.

During the last few years numerous inquiries have been made for some type of hoist which can be used for raising meadow hay or green material on to a stack either from the ground or waggon; it was thought that the following particulars regarding the construction of a one-horse hoist would be of value.

The following illustration gives full particulars:—



Legend—"A" Pulleys; "B" Swivel; "C" Hook; "D" Rope for raising or lowering arm according to height of stack; "E" Collar and Swivel (see enlargements); "F" Stays or guy ropes; "G" Rope tie; "H" Rope to pull material over stack.

Enlargement—"A" Collar; "B" Eye (enlarged); "C" Hook; "D" Pin and Eye; "E" Straps.

Requirements.

Poles.—Upright pole 20 feet long of which 18 feet is above ground level. The pole should be at least 8 inches at the base. The arm should be at least 12 feet long and not less than 4 inches in diameter. The arm is attached to the upright pole by means of collar and swinging attachments illustrated above 12 feet from the ground level.

Pulleys.—Four 4-inch pulleys attached as illustrated. A swivel and hook or grab attachment on end of hoist rope.

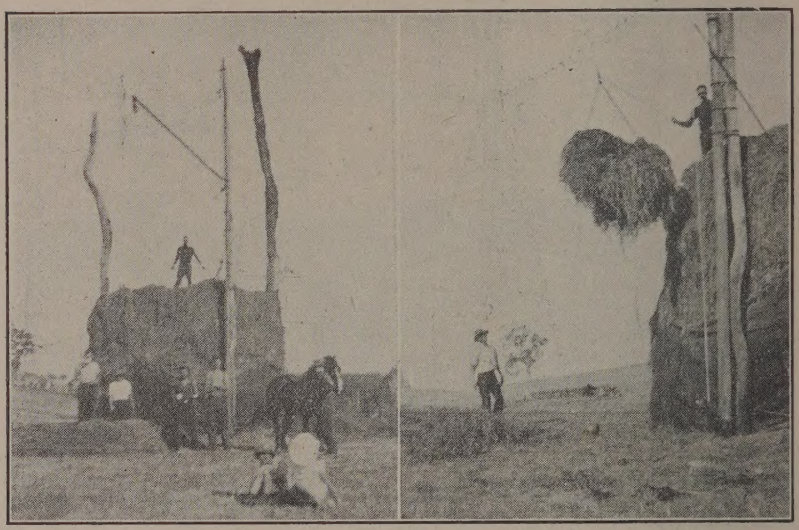
Collar and Swinging Attachment.—A six-inch collar or wound wire fitted around the pole to hold "eye" attachment. This attachment which is let into the pole is made from 14in. x 2½in. x ¾in. iron shaped as illustrated in "B" enlarged. A 1⅛in. hole is drilled to take the hook which is made from 1in. round iron. The end of the hook is flattened and a ⅝in. hole drilled to take the pin which holds the two iron straps on the arm. The two iron straps are made of 15in. x 2½in. x ⅝in. iron with holes drilled through for the pin and bolts, the iron being shaped as illustrated in cross section "E."

The photographs on the following page show a home-made hoist in action on the property of Mr. W. J. Sears, Donnybrook.

Instead of using a hook, grabs can be obtained from machinery firms for lifting the material from the waggon or ground. These will facilitate building operations considerably.

To ascertain the tonnage of meadow hay in a stack, it is first necessary to find the number of cubic feet in the stack. The results of a survey conducted by officers

of the Dairy Branch over the last two seasons indicate that the number of cubic feet of meadow hay per ton ranges from 230 to 640 with an average of 400. The great variation in cubic feet required per ton is due to four main factors, viz., Size of Stack, Composition of Material, Quality of Material, and Type of Material



Stacked. The weight of stacks surveyed ranged from 8 to 70 tons and the material stacked ranged from pure grass to pure clover; some of the material stacked had been cut late and with others left out too long prior to stacking. It is hoped to continue this survey for a few more seasons when the information obtained may be grouped according to the size of the stack and material stacked.

TOXIC PARALYSIS IN SHEEP AND CATTLE.

Stockowners are advised that the vaccine for protecting sheep and cattle against Toxic Paralysis (Botulism) will in future be supplied through the Chief Quarantine Officer (General), Commonwealth Health Department, General Post Office, Perth, to whom applications should be made direct.

It is pleasing to know that, as the result of further research work carried on by the Commonwealth Serum Laboratories, a vaccine will shortly be provided for which only one dose each year is required. This means that one handling of the animals will be necessary which will, of course, greatly decrease the expense and trouble of vaccination.

The doses recommended are:—

For Sheep—one dose of 5 c.cs.
For Cattle—one dose of 10 c.cs.

As Toxic Paralysis (Botulism) occurs during the summer it should be easy to determine the proper time for inoculation. Although conditions may vary in different districts, the best time to treat the stock will probably be about the middle or end of October each year.

THE DETECTION OF BOVINE MASTITIS.

Results of an Examination carried out to determine the Value of certain Colour-Test Outfits.

H. H. KRETCHMAR, B.Sc., A.A.C.I.

1. Recently two field test outfits for the detection of mastitis were submitted to this Department for an opinion regarding their value for the practical detection of mastitis. For the purpose of this paper, they will be called Test Set "A" and Test Set "B." To determine their suitability and degree of accuracy in Western Australian conditions, they were used to examine a number of samples of milk. The same milks also were examined microscopically and the findings then compared.

The term "Mastitis" signifies an inflammation of the mammary gland or udder. In the mildest cases it is shown only by an increased leucocyte content of the milk. If not due to a mechanical injury, some micro-organisms also should be present in the udder. In severe cases the affected quarter or quarters may be swollen and inflamed. In cases of long standing, invasion of the udder tissue generally takes place, and hardened masses of fibrosed tissue may be detected by clinical examination.

The mastitis cases of greatest importance are those which are caused by invasion of the udder with the organism "Streptococcus agalactiae" (syn. "Str. mastitidis"), for such cases apparently never recover completely, even though periods of apparent normality are experienced, and, as the disease is infectious, the affected animals are a menace to the clean members of the herd. The majority of mastitis cases are of this type.

2.—*The Principle of the Colour Tests.*

The tests are based upon the assumption that milk drawn from udder quarters affected with Streptococcic mastitis is generally alkaline in reaction, or occasionally very acid. One of the methods regularly employed by the chemist for the determination of the acidity or alkalinity of liquids is to note the change of colour produced when the liquid to be tested is added to a solution of a suitable organic colour material, generally called an indicator. In the test outfits examined the colour reagents or indicators used were brom-thymol blue and brom-cresol purple. In acid solutions brom-thymol blue is yellow: in alkaline solutions it is blue. In acid solutions brom-cresol purple is yellow: in alkaline solutions it is blue-violet. Thus, if we start with one of the above indicators in the yellow condition and add an alkaline fluid to it, the colour changes to blue or blue-violet respectively. The method by which this test is carried out varies. In the Test Outfit "A" the indicator is impregnated in muslin cloth, and pieces of the cloth are clamped between two cardboard rings. Milk from the quarter to be tested is squirted direct from the teat through the muslin disc. Any change in the colour of the disc and also the presence of any clots on the muslin are noted. With the Test Outfit "B," the milk is drawn directly from the udder into a small test tube, the tube being filled to a mark etched on its side. The indicator is supplied in solution in a small bottle, and a quantity of it is measured out and added to the milk in the test tube by means of a small pipette like an ordinary eyedropper with a mark etched on the glass tube. The test tube is shaken to mix the milk and the indicator, and the resulting colour of the mixture compared with a series of standard colours printed on paper and kept in a hermetically sealed tube suplied with the outfit.

3.—*The Microscopic Examination Method.*

The testing of a herd is complicated by the fact that some animals suffering from streptococcic mastitis shed the streptococci in their milk only at infrequent intervals. Thus, in any scheme which aims at eradicating streptococcic mastitis from dairy herds, it is essential to segregate animals showing a leucocytosis of the milk (*i.e.*, an abnormal cell content), for the leucocytosis may be due to streptococci even though they were not present in the particular sample examined.

The testing of animals for disease control purposes as carried out in this laboratory takes the above facts into consideration.

The selective bactericidal properties of certain dye-stuffs is well known, *e.g.*, gentian violet at a concentration of 1 : 100,000 inhibits the growth of most Gram-positive organisms but allows the growth of most Gram-negative species. The use of brilliant green at a concentration of 1 : 50,000 to obtain a selective growth of the streptococci causing contagious streptococcic mastitis was suggested by Bryan and Huber (Bull. Inst. Past. Rev. et Anal. XXXIII., p. 1112), and is used in this laboratory.

Sterile bottles, with a mark to show the level reached by approximately 50 mls of liquid, are used as sample bottles. 5mls. of an "aged" solution of brilliant green is added to each bottle, the addition being carefully made to maintain sterility. The "aged" solution of brilliant green is prepared from Grubler's dye and sterilised distilled water prepared in a still fitted with a block-tin condenser. The concentration of dye in the solution is 1 : 5,000. The solution is kept for at least 2 weeks before use.

Before collecting the milk sample three of four streams of milk are discarded. The bottle is then filled to the 50 ml. mark. Separate samples from each quarter are taken and all precautions to avoid the entrance of extraneous organisms are observed.

The samples are incubated overnight in the 37°C. incubator. The time of incubation is about 18-20 hours.

Smears are then prepared for microscopic examination according to the method used for the "direct count," as described in Journal, Dept. Agric. W.A., XIV., March, 1937, pp. 65-73, Leaflet 504.

Samples showing the presence of leucocytes and long chain streptococci are classed as "mastitis positive." Samples showing leucocytes in excess of 100,000 per ml., but no streptococci, are classed as "mastitis doubtful." Samples showing no streptococci and having a leucocyte count of less than 100,000 per ml. are classed as "clean."

Results of Previous Tests.

The colour test principle for testing for mastitis is by no means new having been suggested by Van Slyke in 1919.

Reports of comparative tests using this principle and other methods for the detection of mastitis have been published at various times in the literature. The following two abstracts are typical and indicate the results which have generally been obtained.

1. Taken from the *Journal of Dairy Science*, XVII., No. 4, April, 1934, pp. 281, *et seq.*

" . . . . . The hydrogen ion concentration " (*i.e.*, the degree of acidity) "appears to be poorly suited to the detection of sub-clinical mastitis. Occasionally

. . . . the milk from a diseased udder actually is more acid than normal; generally, however, the hydrogen ion concentration is less in milk from diseased udders" (*i.e.*, is more alkaline). "In sub-clinical mastitis this difference frequently is so small as to be impossible to interpret. In acute mastitis the milk generally is alkaline; however, it is usually so abnormal in appearance under these conditions that there is no necessity for clinical identification. The hydrogen ion concentration has limited merit as a clinical method for the detection of mastitis because the variation in reaction between milk from normal udders and udders showing sub-clinical mastitis is neither consistent nor wide enough in range to permit accurate interpretation."

2. Taken from the *Journal of Dairy Science*, XX., No. 7, July, 1937, pp. 443, *et seq.*: "An analysis of nearly 7,000 comparative tests leads to the following deductions:—

The bromthymol blue test detected only 21.1 per cent. of the samples taken from quarters known to be infected with mastitis.

On samples taken from cows diagnosed as free from mastitis the bromthymol blue test gave false readings in only 1.6 per cent. of the cases.

If the bromthymol blue test is positive, there is a 92.7 per cent. chance that the cow will be found positive for mastitis on further examination.

If a bromthymol blue test is negative, there is a 55.2 per cent. chance that the cow is actually negative, and hence a 44.8 per cent. chance that the test is false."

Results from the Tests carried out locally.

1.—*Tests carried out with the "A" test outfit*: *i.e.*, the discs of muslin impregnated with bromcresol purple. 84 samples only were examined, after which it became obvious that there was little point in carrying out further tests. The first three jets of milk from the quarter were discarded and the next passed through the muslin disc.

The colour of each muslin disc as judged by a chemist, a veterinary officer, and the farm manager, turned a light but distinct blue colour with the exception of one disc which turned a deeper blue colour. In the case of the sample which produced the deeper blue colour, the milk was so abnormal as to look like a light brown jelly. Clots were observed on no other discs.

At the time of taking the samples for the colour test, duplicate samples were taken for bacteriological examination in the laboratory. Upon examination the following results were obtained:—

Ten samples gave definite indication of streptococcic mastitis.

Nine samples were abnormal but the cause of the abnormality was not determined.

Sixty-five samples showed no evidence of any infection.

An examination carried out by Mr. E. F. Twaddle, M.R.C.V.S., Veterinary Surgeon attached to the staff of the Veterinary Branch of this Department, showed that the 10 quarters which gave a positive reaction, also showed clinical evidence of infection.

The blue colour produced in all cases where no mastitis was present may have been caused by at least two factors. The indicator material may have deteriorated from age or through storage in unsuitable conditions. The more likely explanation, however, is that, due to the large surface exposed to the atmosphere, the discs absorbed an alkaline vapour, such as ammonia which is produced by rapid bacterial decomposition of organic matter in hot weather. It should be mentioned, however,

that the dairy premises where the test was carried out were very satisfactorily cleaned.

2.—*Tests carried out with the "B" outfit, i.e.,* a given volume of dye solution is added to a given volume of milk in a test tube:

One hundred and four samples were examined and the results obtained indicated that further tests would be of little value.

As in the previous test, the first three jets of milk from each quarter were rejected. The tubes were then filled to the mark and the indicator solution added.

Forty tests were made in this way. Thirty-six samples gave a negative test for mastitis; *i.e.,* the colour of the solution did not show the necessary colour change, and four samples gave the "doubtful" indication, shown by a partial colour change. When the samples were examined microscopically in the laboratory 24 showed no evidence of mastitis, but 16, including the 4 which gave the "doubtful" indication by the test outfit, showed evidence of streptococcic mastitis.

A further 64 samples were collected and examined after arrival at the laboratory, with very similar results: 62 gave a negative test with the colour test outfit and 2 gave a "doubtful" indication. Upon microscopic examination 23 samples showed no evidence of mastitis, but 41, including the 2 samples which gave the "doubtful" indication by the test outfit, showed definite evidence of streptococcic mastitis. Of the four tests which were carried out in the field with a "doubtful" indication result, two were a semi-gelatinous secretion having no resemblance to milk, and a third was very abnormal having many clots and pus.

The results of these tests may be tabulated as follows:—

Results obtained from the 84 *Examinations carried out with the Test Set* "A."

Indications by the microscopic method.	Indications given by the Test Set on corresponding samples.	Clinical Findings.
10 positive cases ...	9 positive tests ... ... 1 strong positive	10 clinical cases, including 1 milk very abnormal
9 doubtful cases ...	9 positive tests	
65 clean animals ...	65 positive tests	

Results obtained from the 104 *Examinations carried out with the Test Set* "B."

Indications by the microscopic method.	Indications given by the Test Set on corresponding samples.	———
57 positive cases ...	51 negative tests ... ... 6 doubtful tests	1 milk very abnormal 2 milks very abnormal
47 clean animals ...	47 negative tests	

The results of these tests thus agree with the findings of previous workers that the colour test (H-ion concentration test, pH test) is of little value for the diagnosis of streptococcic mastitis..

In view of these results the use of colour test outfits for the detection of cows suffering from mastitis cannot be recommended.

THE CONTROL OF MUSSEL SCALE

(*Lepidosaphes ulmi L.*)

By H. R. POWELL, B.Sc. (Agric.),
Horticultural Adviser.

Mussel Scale is a common pest of the apple, although it is not necessarily confined to this host. In most orchards its presence can be detected on "Yates" and "Jonathans"—varieties to which the scale shows a somewhat pronounced partiality. Infestation is not always slight; in fact, it can be so severe that affected trees have their wood literally plastered with scales.

There is no doubt that this scale is spreading amongst the orchards in the southern portion of the State, despite parasitism and the winter use of red spraying oils.

The purpose of this article is to give some information on—

1. The life history of Mussel Scale.
2. The date of emergence of larvae from eggs retained under the shield-like covering of the female scales of the preceding generation.
3. Two methods of control that have been found to be satisfactory on the orchards of Messrs. E. Greenslade and S. Scott, of Mount Barker.

1. *Life History.*—There appears to be only one generation of Mussel Scale each year, the young or larvae hatching from egges retained under the old scales of the females. These old scales are very tenacious and remain firmly attached to the bark for years.

The larvae, light brown in colour, possess legs six in number that enable them to move freely to portions of the tree that offer scope for permanent settlement. Once settled in position, usually under cover, or on the weather protected sides of the stem and branches, the object of the young scales is to literally "dig in" as quickly as possible. The sap sucking mouth-parts are inserted into the bark and the devitalising effect on the host is begun.

With disuse the legs atrophy, and on the outer surface of the body a scaly secretion slowly forms into a hard protective covering, that persists long after the insect has completed its life cycle.

The female scale, after several moults, is at maturity darkish grey in colour, slightly curved and elongated, with the widest portion at the distal or posterior extremity—hence the derivation of the name "Mussel."

The male scales, however, are by no means as conspicuous, being much smaller and lighter in color. They give rise eventually to winged forms that fertilise the females and shortly afterwards die, through imperfect development.

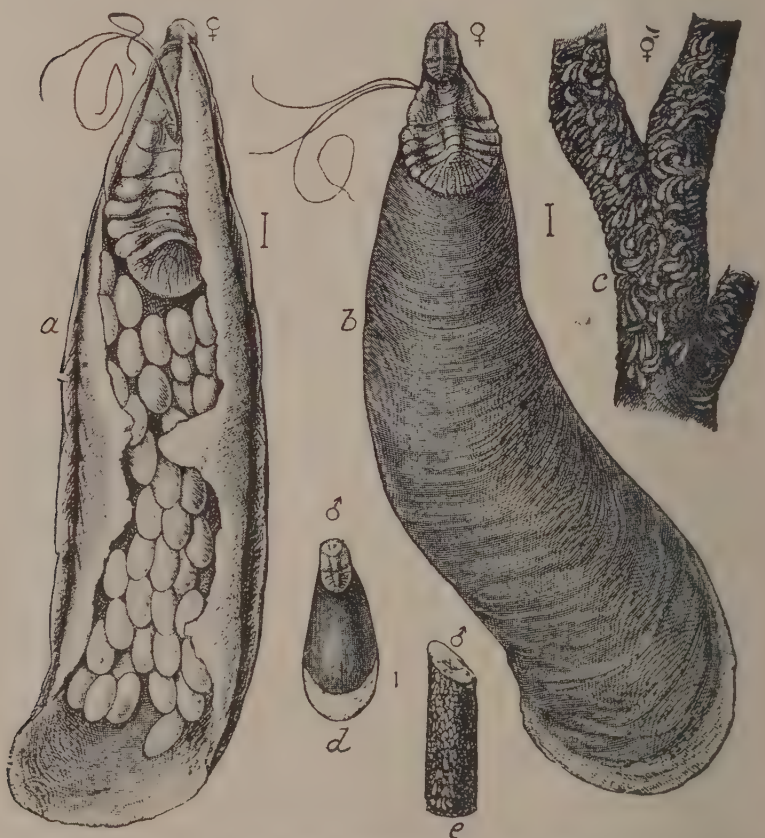
The eggs then mature under the female scales.

2. *The Determination of the Date of Emergence of Larvae.*—The most vulnerable period in the life cycle of all scale insects is that extending from the hatching of the eggs, or from the birth of living larvae, as with some scales, viz., San José, to the period before the formation of the hard shield-like covering, when their bodies are devoid of protection.

To determine the time of hatching, weekly visits were made to Mr. E. Greenslade's orchard from the beginning of October, 1937, to December, and it was not until the 10th of the latter month that maximum emergence was noticed. The newly hatched scales were present in large numbers, taking up permanent positions on practically every available portion of twig, branch and stem.

3. *Control.*—(a) As the customary use of Red Spraying Oil had failed to check the scale on Mr. Greenslade's property, it was decided that a Lime-Sulphur Spray should be substituted. This was applied on the 20th September at a strength of 1:12, care being taken that the trees were well covered; one "Yates" heavily infested was left unsprayed as a control.

For a considerable time the sprayed trees appeared to be unaffected by the spray. The old scales, when scraped away with a knife, contained eggs that appeared to be in fresh viable condition—in every way comparable to those found



The Oyster Shell Scale; a, female scale from below, showing eggs; b, same from above; c, female scales; d, male scale; e, male scale, enlarged.

(*After Dr. L. O. Howard.*)

on the unsprayed tree. From the beginning of December, however, young scales began to appear on the unsprayed tree, but on the sprayed trees, even well into February, no live scales could be found.

Thus, it can be stated that lime-sulphur at a strength of 1:12, applied in the third week of September, exerts a complete control over Mussel Scale without damage to the tree.

Control (*b*). Having determined the time of emergence of the young scales it appeared that the use of a White Oil Spray at this period would prove satisfactory.

Accordingly, the unsprayed tree on Mr. Greenslade's orchard was sprayed with White Oil at a strength of 1:40 on the 10th December, and on Mr. Scott's orchard two "Yates" very heavily infested with Mussel Scale were sprayed a week later with White Oil at strengths of 1:40 and 1:60 respectively. Care was taken that every portion of the trees was covered by the spray.

On subsequent visits it was impossible to locate any live scales on the sprayed trees, thus showing that the control of Mussel Scale by White Spraying Oil at the strengths used was very efficient.

It is quite possible that weaker concentrations of White Oil, combined with Nicotine Sulphate, will prove effective in exerting a control, not only for Mussel Scale, but for Red Spider and Bryobia Mite as well, if used during mid-December. Next season steps will be taken to test this.

CONCLUSIONS.

1. Mussel Scale, if left unchecked, has a serious devitalising effect upon infested fruit trees.

2. Maximum emergence of young scales occurred during the middle of December in 1937.

3. Effective control consisted in spraying with
   (a). Lime Sulphur 1:12 during the third week of September.
   (b). White oil 1:60 during the middle of December.

WARNING.

1. Lime Sulphur should not be used at the strength stated if the spurs are bursting, otherwise serious damage will result.

2. As hot weather may be expected during December it is necessary that cool days be chosen for the application of White Spraying Oil.

"THE JOURNAL OF AGRICULTURE"

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FOURTH INTERNATIONAL GRASSLAND CONFERENCE.

The report of the Fourth International Grassland Congress held in Great Britain from July 8th to 23rd, 1937, indicates that 450 delegates from 37 countries were in attendance.

Under the presidency of Professor R. G. Stapledon, a large range of papers was submitted and discussed, and the exchange of information and ideas is anticipated to accelerate the rate of grassland research in the various countries.

Quite a number of topics of interest to farmers in Western Australia were considered, and the following notes give some brief outline of the more important of these.

In his presidential address, Professor Stapledon emphasised that the proper use of grass and grassland is a matter of systems of farming and, therefore, of facilities. The regional survey method was suggested as the best basis of pasture development, and, following this survey, the use of the right strain of the comparatively few species that really suit the needs of any well defined natural region. In considering the various factors affecting the establishment and maintenance of a pasture, the effect of the grazing animal was considered the most important.

The value of legumes in pasture was referred to in very emphatic terms. "No grassland is worthy of the name unless a legume is at work." Make the conditions suitable for the legume, and manage the sward to favour the legume as well as feed the animal—the battle will be won."

The problem of management was surveyed as being threefold:—

Firstly—How to produce grass when it is most urgently wanted.

Secondly—How to farm grass not only with a view to maintaining but also to progressively increasing soil fertility.

Thirdly—How to manage grass so that young, vigorous, succulent grass of maximum food value is available for the animal.

In discussing this, rotational treatment of the farm as a whole was suggested as a means of maintaining and increasing pasture production. The importance of selecting strains to supply growth during the winter was mentioned also.

Amongst the plenary papers the subjects discussed included grass-drying, the nutritive value of pasture for wool production (which directed attention to the necessity of investigating pastures by considering their effect on the quality of the wool produced), plant breeding, and the selection of plants to suit certain localities. Klapp tendered a paper on "The Principles Governing the Value of Herbage Plants for Hay and Pasture" and concluded that the capacity for yield and after growth is governed by the interaction of—

(a) amount and vigour of pasture which remains after cutting or grazing;
(b) the duration of the rest period between two cuts or grazing periods.

The product of (a) and (b) is certain to be quite different under mowing and under grazing.

Virtanen explained the old established fact that non-legumes were benefited by association with legumes. He showed that recent exact work with sterile culture technique had demonstrated that nitrogenous compounds are excreted into the soil from the legume nodules and that this excretion commences immediately on the formation of nodules. The sequence by which atmospheric nitrogen was turned into products available for plant food was explained.

The section dealing with grass-land ecology was devoted principally to the development and maintenance of pasture lands in different countries, and particular attention was paid to range pastures and pastures in arid climates.

The most important papers dealing with seed mixtures were those recording the tendency to lighter rates of seeding in areas of low rainfall. Two papers by Australians were submitted—one by Whittet of New South Wales and the other by Griffiths Davies of South Australia. Thomas of Aberystwyth, Wales, stressed the importance of strain in herbage plants. Improved strains outyield ordinary commercial strains both as hay and pasture. How the effective grazing season could be prolonged by resting a paddock, or by conserving the feed in situ was described.

A. B. Adams of Muresk Agricultural College, Western Australia, contributed a paper to the plant breeding, genetics and seed production section on "The Strains of Subterranean Clover which are grown under Western Australian conditions."

Further interesting papers to this section dealt with the difficulties of the plant breeder working with pasture types. It was suggested that, while the best indication of productivity is to be found in the height of the plant, its degree of leafiness and tillering, the elimination of individuals has to be based on other more readily distinguishable characters such as early ripening, resistance to disease and frost, etc. In considering seed production from pasture grasses, it was stated that very leafy strains had in their favour—(1) greater persistency, although combined with lower seed yields per acre; (2) the threshed straw is of better feeding value than the straw of hay types.

Methods suggested to overcome the disabilities of pasture strains in relation to seed production were:—

1. The selection of deep fertile land in a suitable climate.
2. Sowing the seeds, except those of Rye Grass, in wide drills without cover crops.
3. Adequate manuring.
4. Mechanised cultivation and harvesting.
5. Weed suppression by the use of chemicals.

The difficulties of harvesting of clover seed, and the incidence of pasture pests were also discussed.

The fertility of the soil and the manurial requirements of grassland provoked a series of valuable contributions.

The influence of a deficiency of phosphate in contributing to mineral deficiency diseases in live stock was referred to by Hanley who traversed the results of experiments at Cockle Park into the need for lime and phosphate in grassland improvement.

A contribution on the manuring of grassland in arid regions was made by a delegate from Hungary. He reported that farmyard manure was less valuable on grassland than on arable land, but this was possibly explained by the higher humus content of the grassland swards. The conclusion was that no material improvement could be expected as a result of manurial treatment alone. The aeration of the soil, a deeper crumb structure, and the conservation of winter moisture were considered to be of more importance.

Further papers reported the success attending regular manurial treatment of pastures principally using phosphates. The ratio of potash to nitrogen in assisting

growth and protein production in a pasture was discussed also. The advantages gained by the use of nitrogenous fertilisers were presented in papers from Sweden, the Netherlands, and Germany. In the latter paper the prerequisites necessary for the economic use of nitrogenous fertilisers were suggested to be:—

1. Suitable regulation of the water table, 1 to 1.2 metres being suggested.
2. Adequate humus content of the soil.
3. A dense sole.
4. The form of fertiliser to be selected according to soil conditions.
5. Adequate supply of other plant nutrients.
6. Most favourable time for application being the months of vegetative development.

The nutritive value of pastures was discussed in papers presented on "The Chemical Changes that Occur in the Stem, the Leaf, and the Whole of Grasses with Advance to Maturity." The bearing of these results in indicating the superiority of some strains over others was pointed out.

An interesting paper by Konig of Germany dealt with the influence of different manurial treatments upon the composition and value of the herbage of permanent grassland. The direct and the indirect influences of manurial treatments were discussed. The former varies the chemical composition of the plant according to the fertiliser used, *e.g.*, the increase of protein content is produced by the use of nitrogenous fertilisers, while an increase of phosphoric acid, potassium or calcium is brought about by the use of the element in question. The indirect influence is brought about by the alteration of botanical composition.

The method of determining the fertiliser requirements of soils by analysing the ashes of the hay crop was discussed also.

L. I. Jones, of Aberystwyth, suggested methods of studying the comparative values of pastures as measured by the grazing animal.

The subject of grass-drying in England was covered in an excellent paper by Roberts, who, in addition to describing the process, gave an outline of the cost of the method.

Papers also were presented dealing with losses in fodder conservation, and the advantages and disadvantages of silage made by various methods.

In the section devoted to the management and the economics of pasture, references were made to the effect of various systems of grazing. Close grazing resulted in weaker growth with the plots becoming increasingly weedy. Plots harvested at intervals gave larger yields than those cut at more frequent periods. Root studies indicated a marked reduction in weight of roots and of rhizomes where the grass was cut close throughout the season.

A paper dealing with "New Zealand Grassland" referred to the reversion of sown pasture to bushland where grazing and fertilisation were not carried out. The tendency to more simple grass-clover mixtures in sowing was stressed with the suggestion of a development towards a segregation of pasture types into different paddocks instead of more complex mixtures in all paddocks.

Topdressing with fertiliser is the greatest single factor in grassland management, while harrowing has decreased in favour. The trend towards smaller fields with rotational grazing also was mentioned.

Orr contributed a paper on "The Economics of Grass Cultivation" in which a survey of studies into the effect of grazing on the constituents of the sward was made. Attempts to manage the grassland so as to supply the needs of stock without allowing the sward to suffer were outlined. The report concludes with papers

dealing with "Methods of Determining the Botanical Composition of Pastures and with the Size of Paddocks."

The publication embodying the papers contributed makes a most interesting and valuable source of reference to the trends in grassland research throughout the world, and the editor deserves congratulation on the form in which this report is arranged.

An invitation extended by Dr. D. S. Huizinga to hold the fifth Congress in the Netherlands in 1940 was accepted. A further invitation was extended by Count Teleki to hold the sixth Conference in Hungary in 1943.—M. Cullity, Sen. Agric. Adviser.

BEE COMBS.

Preparation and Manipulation.

By H. Willoughby-Lance.

Next in importance in the production of honey to the stocking of hives with pure bred bees of a good strain, is the provision of good combs, and the careful and intelligent arrangement of them in the hive. Very often this is overlooked by beekeepers, either owing to lack of knowledge or carelessness.

The invention of the movable frame and wax foundation and the centrifugal extractor during the last century entirely revolutionised beekeeping, and enabled beekeepers to regulate the rearing of brood, reduce swarming, and produce larger crops of honey; and the scientist to study with exactitude the economy of the hive. The days are past when at the end of the season the beekeeper, to obtain the crop of honey, had to either destroy the bees or drum them into another skep or box, cut out the comb, and separate as far as possible the brood comb from the combs of honey, which were crushed and often contained small quantities of eggs, brood, or pollen. The honey was then strained; but all the straining could not rid the honey of the flavour of the brood and pollen.

Present-day methods are absolutely hygienic, as anyone can testify who has witnessed the removal of honey from the hives, and its extraction and preparation for the market.

Frames.—Good combs can be used for many years for brood rearing, or the storage or honey. To obtain these a good pattern of Root Hoffman or other standard self-spacing frame should be used, and the Victoria pattern with square sides is recommended.

There are four sizes of standard frames at present in use in Australia. These are similar to those generally used in America. The dimensions of our frames, however, are different from those generally used in Britain. All four sizes are of the same length, that is 19 inches long, with projecting tags for suspension in the hive, the only difference being in the depth. The standard size is 9⅛ inches deep, and is generally used by all the large beekeepers for both the brood chamber and the supers or honey chambers. The three-quarter depth or W.S.P. Frame, which is 7¼ inches deep, has only come into use recently and is favoured by some beekeepers as it allows more gradual expansion of the hive for brood rearing or storage purposes.

The Bolton or Ideal Frame is 5⅜ inches deep and was originally introduced for the same purpose as the W.S.P., and for controlling swarming by Bolton's

method of reversing the combs. The half depth is 4½ inches deep and is intended for use as a super for honey storage when the flow is not heavy enough for the full depth frame. The advantage of using this frame for storage as against the Ideal or W.S.P. is that the standard extractor will take two frames in the place of one standard full depth; whereas it will only take one Ideal or W.S.P.

Another important recent use for the half depth or Ideal Frame is to place a box of these full of honey on the hive as a food chamber for the winter and spring brood rearing. Colonies with food chambers are ensured against starvation and come out stronger and start brood rearing earlier than those with a scarce supply of honey.

Foundation.—All frames should be strongly wired and fitted with full sheets of foundation. The only exception is where swarms are hived. These may have starters instead of full sheets, as swarms are in a condition for comb building and invariably build worker comb in the first instance. The practice, however, is questionable, as some bees are bad comb builders and do not always build straight combs, and sometimes, even when foundation is given, bush bees that are used to building comb just as they please in hollow trees, will make a bad job of it.

There are three important reasons why full sheets should be used:—

(1) Experiments have proved that bees consume from 12 to 16 lbs. of honey to make one pound of wax, therefore, for every pound of wax foundation supplied, the bees will store an extra 12 to 16 lbs. of honey.

(2) By giving a straight full depth vertical foundation, the bees will build thereon in the right direction, and fill the frame with a straight good comb, so that any comb can be removed without cutting or breaking, as required by the Bees Act.

(3) As the foundation is embossed with the bases of worker cells, the bees will build all, or nearly all worker comb. If only starters are given, the bees just before swarming time, and often when there is a honey flow on, will frequently build drone instead of worker comb. Then when the queen lays eggs in these cells, she will lay drone eggs, and hundreds, or even thousands of drones will be hatched instead of workers, and the honey crop will be much reduced.

It will, therefore, be obvious that it pays well to use full sheets of foundation.

Wiring.—There are several methods of wiring. Three of the most general are illustrated herewith. Fig. 1 with four parallel wires is the simplest, and probably the most general, and is adapted for electrical embedding, whereas the other two have to be embedded with a warm spur wheel. Frames as purchased usually have four small holes drilled in the end bars ready for the wire. Two small tacks should be driven half home, one near the top hole and one near the bottom hole of one end bar at Nos. 1 and 8. Now take the reel of wire, which should not be of smaller gauge than No. 28 B.W.G.—unless the new non-stretching wire is used—when No. 30 will be quite strong enough. This wire is now obtainable from suppliers of bee requisites.

Thread the wire through the holes and twist the end round the tack; drive it home; stretch the wire until it twangs like a musical instrument; twist round the other tack and drive home. When fitting the foundation, the frame should be placed upside down and the foundation threaded between the wires, so that the wires are on alternate sides of the foundation, which must now be secured to the top bar. If an electrical embedder is used, contact is made at each end of the wire for a few seconds until the wire is warm and sinks into the wax. If a spur wheel embedder is used, this is heated in a flame and run along the wire quickly and evenly and presses the wire into the warm wax.

The wiring of Figures 2 and 3 is similar, but the method of threading varies, as shown by the numbers. Some beekeepers use No. 26 galvanised iron wire for wiring Fig. 3, which makes a very strong comb not liable to break in the extractor, but the bees sometimes object to the thick wire and eat away the wax along its edge.

For Ideal or Bolton frames, or for half depth frames for supers, two cross wires are usually sufficient. For W.S.P. frames, which are used for both brood chambers and supers, three cross wires should be used.

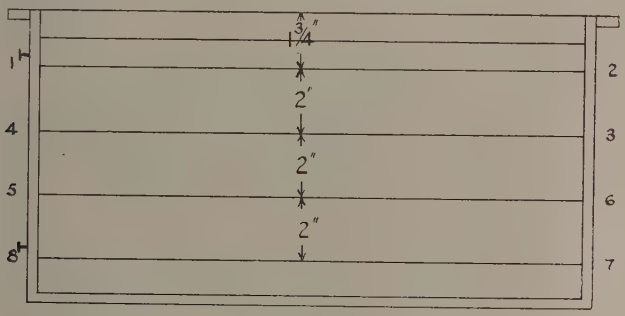


Fig. 1.

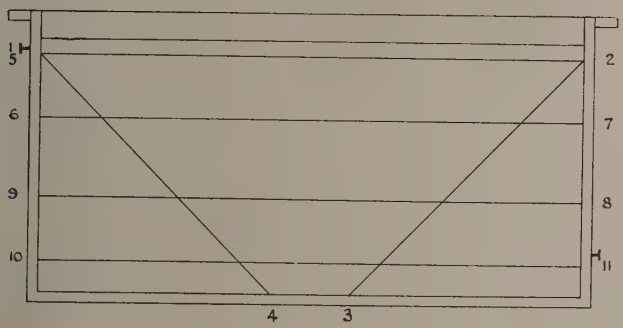


Fig. 2.

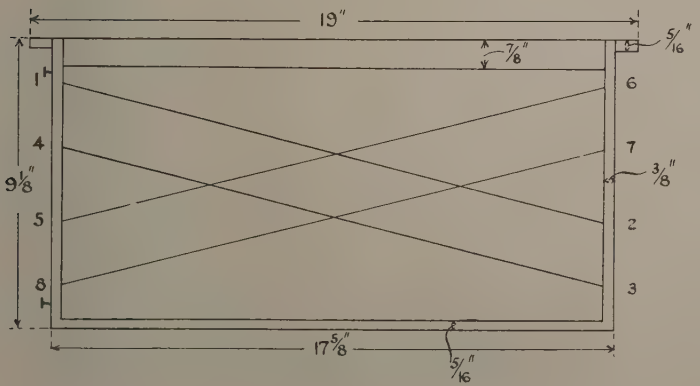


Fig. 3.

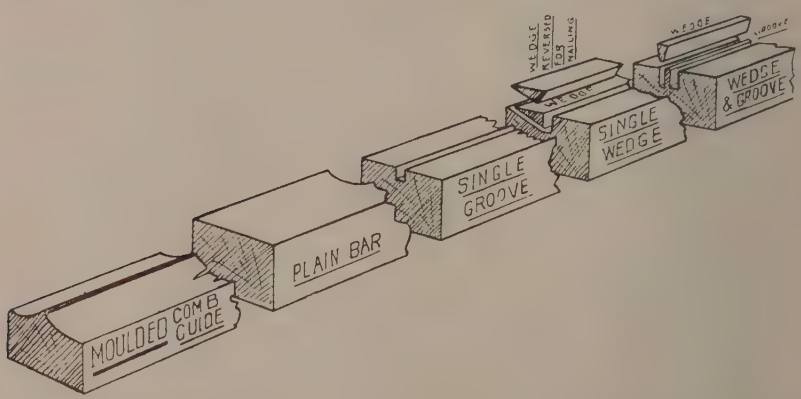
Fitting Foundation.—There are several methods of fixing the foundation to the top bar.

Wedge and groove frame.—With the wedge and groove pattern of frame, the foundation is inserted in the middle groove, and the wedge pressed or tapped firmly into the side groove, so as to press the middle strip tight against the foundation. The objection to this method is that the grooves are harbours for wax-moth, which burrow into them for the purpose of pupating, eating away the wood to make their cocoon.

Single wedge frame.—With this pattern the wedge is removed from the bar and the foundation inserted; the wedge is then turned upside down, and replaced in the bar, and pressed firmly against the foundation. Four or five thin nails are then driven in, in a slanting direction through the wedge, to hold it tight against the foundation. In this pattern there is not much opportunity for the wax-moth to do damage.

Mounded comb guide is another pattern, very little used, and I do not recommend it.

Single groove.—This is probably the best type to use. The foundation is inserted into the groove and hot wax run along both sides of the foundation. This fixes it firmly into the bar, and there is then no possibility of the foundation falling away from the bar with the weight of the bees, as often happens with the wedge and groove, and single wedge, unless the beekeeper is careful to make a firm job.



For Embedding the Wires.—A board ¾in. thick should be made so as to fit easily into the frame. This is placed on the bench, and the frame placed over it, so that the foundation lays on the wood; the spur wheel can then be run along the wire without breaking the foundation. When using an electrical embedder, it is advisable to place a similar board, with a weight thereon, on top of the foundation, to press the wire on to the foundation before making the electrical contact.

Wired Foundation.—The wiring of frames and fitting of foundation is one of the beekeepers most tedious jobs, and is a comparatively slow process. Much thought and time have been spent by inventors to improve the strength of combs and the saving of time; such as aluminium foundation and other substitutes for wax, but none has been adopted to any extent. Two of the latest are three-ply foundation and wired foundation, both of which are being used to a large extent in America. The three-ply foundation is made of three very thin sheets of wax,

the centre one being of vegetable wax for strength, and the two outer ones of natural beeswax. This is used and fitted in the same way as ordinary foundation.

The wired foundation was first made by Dadant & Sons, U.S.A., and is now also made in a slightly different pattern by Pender Brothers, N.S.W. I have tried the Dadant foundation, which is used in special frames with slotted bottom bars, and find that it does away with the tedious wiring and embedding and saves about 75 per cent. of time. The combs drawn out by the bees are as perfect as one could desire—working cells from top to bottom bar with only an occasional pop hole in the corners.

The Pender wired foundation is similar, but has straight vertical wires instead of crimped, and the fixing to the bottom bar is slightly different, but the resultant combs should be as good as the Dadant, and I would strongly recommend beekeepers to give it a trial.

The fitting of wired foundation into frames is a very easy matter. The frame to be used is the single wedge, or single groove. If obtainable, the square wedge is preferable to the V. type. All that has to be done is to insert the foundation into the frame, place the wedge into position, and nail; or in the case of single groove, run the hot wax into the groove.

Building the Combs.—The next job is to get the frames of foundation drawn out into full combs. They may be given to either swarms or to colonies that are rapidly increasing in numbers, or when there is a prospect of a honey flow. If the swarm is small, or the bees are only increasing slowly, it is best to give only two or three frames of foundation at a time, because if there is only a little honey coming in, the bees often tear down some of the foundation to use on other frames. Also in cool weather an excessive number of frames of foundation reduces the temperature of the hive.

Position of Combs.—Now as to the situation of frames in the hive. It must be remembered that the brood nest is usually in the centre and warmest place of the hive, and that the bees cluster thereon to hatch the brood. The outer circle of these centre combs contains pollen and honey, and the combs next to the brood nest also contain pollen and honey, being easily accessible to the young bees that have to feed on them to make the chyle or milk food for the larvae. Next come combs of honey, and lastly, if there is still room, combs in course of construction.

Increasing the Brood Nest.—The natural place, therefore, for undrawn foundation is on the outside. However, in warm weather, when there is plenty of honey coming in and breeding takes place, single combs may be placed next to the brood nest, as this hastens their drawing out, the bees being anxious to fill them with brood or food. A good time to get the combs drawn out is when the spring is well advanced and the brood chamber full of bees, brood, and honey. It should be the aim of all beekeepers to get two chambers full of brood and honey before trying to secure any surplus honey. To do this, take a body the same size as brood chamber to use as a second storey. Now take two or three frames of brood out of the bottom chamber and place in the centre of the second; close up the remaining brood combs and place frames of foundation on each side between them and the combs of honey, first damaging the cappings of any honey above the brood. The bees will then remove the honey and the queen will deposit eggs therein; otherwise there might be a bar of honey between the two chambers which the queen would not pass. If there is only a little honey in the brood combs placed in the second storey, it would be as well to transfer a comb of honey with them. Now fill up the second chamber with the frames of foundation, and close up. If the season is good, and the queen young and of a good strain, it is surprising how quickly she will fill the two chambers ready for the main honey flow, when a further one or two bodies may

be placed on top. No excluder will be needed if the beekeeper manipulates the frames in the two lower chambers correctly, as the queen seldom climbs to the third storey unless overcrowded below.

Manipulation of Combs.—In the manipulation of hives with old combs, the dark worker combs should always be placed in the centre where the brood nest is, and any drone combs on the outside next to the walls of the hive, as this is the last place the queen will lay in, unless, of course, drones are required for mating purposes, in which case one or two such combs should be placed in the centre. Drone combs may also be placed in the supers for the storage of honey.

Dark worker combs are also useful to place in the second storey next to the brood, or with a swarm that has been hived; one comb of brood and one dark worker comb for the queen to lay in will often prevent the swarm from absconding.

Renewal of Combs.—The cells of combs that have been used for the rearing of many generations gradually become smaller, as each chrysalis leaves a thin skin behind it. When the cells are noticeably small, the combs should be replaced, otherwise the young bees will not be able to develop to their natural size.

Badly damaged combs, or those with an excessive amount of drone cells, or those which have sagged and been patched up by the bees, so that there are a number of irregular cells that cannot be used for brood rearing, should never be placed in the brood nest, but should be taken away and melted down—otherwise there will be so much waste space where every inch is valuable, brood rearing of the workers will be restricted, and the tendency to swarm will be increased.

Stretched cells on the upper portion of the combs in the lower brood chamber have a tendency to act as a bar to the queen in passing from one chamber to the other—should there be any of these, they should be placed in the second chamber. Careful sorting and arrangement of all combs is of great assistance to the beekeeper in the prevention of swarming and the storage of surplus honey.

THE FRUIT INDUSTRY IN WESTERN AUSTRALIA.

GEO. W. WICKENS,
Superintendent of Horticulture.

FRUIT PRODUCTION AND EXPORT.

It will be noted from figures given hereunder that 58.8 per cent. of the total area under orchards in Western Australia is devoted to apple growing, and it will be realised that when, for any reason the apple crop is light, the gross fruit production in that season suffers to a much greater extent than when any one of the other kinds of fruit has a crop below the average. During the past few years our apple trees have cropped so consistently that we began to flatter ourselves that growers had by up-to-date methods eliminated the bugbear of low yields, but "pride goeth before a fall," and very many apple orchards in Western Australia during the season under review had little more than half a crop: though the situation was saved to a considerable degree by younger trees coming into bearing and some good crops on old trees in certain districts. Those growers whose orchards are in the areas devastated by hailstone and cyclonic wind storms last year have had a particularly bad spin, for their trees were carrying record crops of fruit, much of it ready for marketing when it was destroyed by storms, and this year those trees, in common with many others which missed the damage, are just having a rest, recuperating and getting ready for a special effort next season. I think

it is probable the dry seasons of 1935-36 and 1936-37 were contributory causes to the partial failure in 1937-38: but in 1934-35 the apple crop comprised 1,228,300 cases: in 1935-36 1,235,849 cases: in 1936-37 though the returns show only 1,045,369 cases there is no doubt the production amounted to 1,400,000 cases, and with or without dry weather it is unusual for apple trees to crop heavily in successive seasons, so, as stated above, they returned to normal and rested.

With supplies to our best overseas market—United Kingdom—regulated by quotas on the basis of average quantity shipped during the preceding three years' period, this year's light crop following on last year's partially lost crop may, next year, affect Western Australia very seriously, our exports to the United Kingdom during the preceding years being as follow:—1936, 619,129 cases: 1937, 429,660 cases; 1938, 337,785 cases. If the quota allotted to Western Australia is based on the average of the three years mentioned then we should be limited to an export of 462,191 cases, and if the promise of heavy crops now showing in the buds of apple trees throughout the State is fulfilled, that quantity will be greatly below our requirements, as illustrated thus—

Area under *bearing* apple trees 1934–35, 8,617 acres; production 1,228,300 cases = 14 cases per acre.

1935–36—*Bearing* area, 9,027 acres; production 1,235,849 cases = 136 cases per acre.

1936–37—*Bearing* area, 9,486 acres; production 1,400,000 cases (actual returns plus estimated loss) = 147 cases per acre.

Figures for area and production in 1937-38 are not yet available, but the bearing area will increase to at least 10,000 acres in season 1938-39 which, with a crop of 150 cases per acre would yield 1,500,000 cases. Markets in sight, if the United Kingdom quota is as stated, are—

	Cases.
United Kingdom	462,191
Consumption within Western Australia	400,000
Overseas markets, other than United Kingdom, say	235,000
Total	1,097,191
Balance on hand	402,809

constituting a very grave problem indeed.

From particulars listed hereunder it will be seen that the quantity of pears shipped this year only amounted to 27,417 cases: this compared unfavourably with 31,111 cases in 1937, and 45,785 cases in 1936: and was due in a large measure to export varieties being definitely on the light side in cropping.

Table grapes showed a gratifying increase, and the number of cases exported—72,752—constitutes a record for Western Australia, the largest total previously being 61,745 cases which were sent overseas last year, 1937.

Oranges exported only reached the small total of 3,480 cases, and considering that the average annual crop is upwards of 300,000 cases it can be seen that the quantity exported has little effect in relieving the local market.

Full particulars showing the quantities of each kind of fruit exported for the year ended 30th June, 1938, are shown hereunder. These include small quantities shipped in the first six months of the year between 1st July, 1937, and 31st December, 1937, comprising 3,027 cases of apples; 2,736 cases of oranges; 12 cases of grape fruit; 138 cases of lemons; 208 cases tomatoes; 9 cases peaches; 3 cases apricots and 3 cases of plums.

EXPORT OF FRESH FRUIT FROM WESTERN AUSTRALIA TO OVERSEAS MARKETS FOR YEAR ENDING 30TH JUNE, 1938.

Destination.	Apples.	Pears.	Grapes.	Oranges.	Lemons.	Grape Fruit.	Peaches.	Plums.	Apricots.	Tomatoes.	Melons.	Pomegranate.	Total.
	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.
London ...	206,625	18,001	5,474	1	...	3	8	...	4	...	...	...	230,116
Southampton ...	13,595	...	488	...	...	...	...	...	...	...	...	...	14,083
Hull	10,420	...	...	...	...	...	...	...	...	...	...	...	10,420
Liverpool ...	43,882	...	450	...	...	...	...	...	...	...	...	...	44,332
Glasgow ...	63,263	...	...	...	...	...	...	...	...	...	...	...	63,263
Hamburg ...	73,200	2,208	621	...		...	...	...	...	...	...	...	76,029
Stockholm ...	74,632	5,914	1,390	...	...	...	...	...	...	...	...	...	81,936
Singapore ...	26,719	629	22,333	2,151	175	10	80	253	...	211	136	1	52,698
Palembang ...	86	...	7	...	...	...	...	...	...	...	...	...	93
Penang	4,276	64	3,986	558	2		5	3	...	1	...	...	8,895
Belewan ...	525	4	214	4	...	...	...	...	...	...	...	...	747
Batavia... ...	3,012	219	2,314	74	...	...	5	25	...	18	20	...	5,687
Sourabaya ...	1,255	177	1,501	10	...	...	...	73	...	...	...	...	3,016
Port Swettenham	4	...	3	...	...	...	...	...	...	...	...	...	7
Samarang ...	873	30	1,429	32	...	...	...	...	...	...	...	...	2,364
Bangkok ...	431	2	326	...	...	...	...	1	...	...	...	...	760
Saigon	988	30	708	10	...	...	...	...	...	...	...	...	1,736
Rangoon ...	110	...	900	...	...	...	...	...	...	...	...	...	1,010
Malta	...	...	...	35	...	15	...	...	...	...	...	...	50
Aden	1,012	...	...	...	...	...	...	...	...	...	...	...	1,012
Durban ...	173	...	...	...	...	...	...	...	...	...	...	...	173
Bombay ...	1,986	...	991	...	...	...	...	...	...	...	...	...	2,977
Calcutta ...	918	35	1,787	81	...	...	...	...	...	...	...	...	2,821
Colombo ...	2,266	75	26,272	509	...	14	5	33	...	...	...	...	29,174
Madras	921	29	1,165	15	...	...	...	...	...	...	...	...	2,130
Port Said ...	7,531	...	393	...	...	...	...	...	...	...	...	...	7,924
Totals ...	538,703	27,417	72,752	3,480	177	42	103	388	4	230	156	1	643,453

Acreage and Production.

The total area under orchards for season 1936-37 (latest figures available) show a small increase over that of the previous year, the difference being 647 acres, from 21,494 to 22,141. The main increase is represented by apple trees—269 acres. Other small increases are orange trees, 75 acres; almond trees, 49 acres; and peach trees, 45 acres.

Full particulars of acreage and production of all fruits, including vineyards, for season 1936-37 (latest figures available) are as follow:—

ACREAGE AND PRODUCTION OF FRUIT IN WESTERN AUSTRALIA.

Season 1936-37.

ORCHARDS.

Kind of Fruit.	Area.			Production.
	Productive.	Unproductive.	Total.	
	acres.	acres.	acres.	
Oranges	2,608	450	3,058	302,235 bushels
Mandarins	139	41	180	14,981 ,,
Lemons	426	73	499	63,685 ,,
Other Citrus	18	27	45	1,677 ,,
Apples	9,486	3,545	13,031	1,045,369 ,,
Pears	864	166	1,030	101,472 ,,
Quinces	85	15	100	8,620 ,,
Apricots	607	95	702	63,668 ,,
Peaches	643	221	864	67,373 ,,
Nectarines	161	64	225	17,175 ,,
Plums	862	274	1,136	86,593 ,,
Bananas	164	85	249	30,151 ,,
Cherries	28	22	50	46,950 ,,
Almonds	283	74	357	71,805 ,,
Figs	338	60	398	39,375 ,,
Strawberries	33	...	33	51,468 punnets
Passion Fruit	51	...	51	5,804 bushels
Pineapples	10	5	15	9,981 No.
Other Fruit	73	33	106	
Small Fruits	12	...	12	
Totals	16,891	5,250	22,141	

VINEYARDS.

	Area.	Production.
Table Grapes	1,038	58,393 cwts.
Wine Grapes	1,613	42,564 ,,
Drying Grapes	2,474	195,920 ,,
Not bearing vines	980	...
Total	6,105	296,877

Importation of Fruit Trees and Plants.

Apple trees as usual bulk largely in the returns showing importation of nursery trees from the Eastern States; the number 33,529 being sufficient to plant

out 335 acres, with an additional 20,648 stocks for propagation purposes in the local nurseries. It is interesting to note a new fruit is figuring in our list, and in quite respectable quantities. I refer to the importation of 33,159 tung oil trees. Full particulars are as follow:—

PLANT DISEASES ACT, 1914.

Return of Fruit Trees and Plants Inspected at the Ports of Fremantle and Albany for Year ending 30th June, 1938.

Kind of Trees.	Fremantle.	Albany.	Total.
Apple	26,461	7,068	33,529
Apricot	2,232	99	2,331
Almond	2,525	40	2,565
Cherry	690	65	755
Fig	3	8	11
Lemon	3,487	10	3,497
Loquat	413	3	416
Mulberry	873	3	876
Nectarine	1,427	40	1,467
Mandarin	1,051	...	1,051
Orange	9,233	9	9,242
Grape Fruit	1,035	1	1,036
Peach	6,502	207	6,709
Persimmon	105	2	107
Pear	3,372	132	3,504
Plum	4,738	99	4,837
Quince	62	16	78
Pomegranate	25	...	25
Banana	2	...	2
Walnut	97	9	106
Other Nut	934	...	934
Chestnut	...	1	1
Cumquat	72	...	72
Strawberry	3,908	100	4,008
Raspberry	137	18	155
Currant	201	24	225
Gooseberry	188	6	194
Loganberry	150	12	162
Apple stocks	20,648	...	20,648
Apricot stocks	2,000	...	2,000
Pear stocks	3,000	...	3,000
Peach stocks	3,000	...	3,000
Orange	2,000	...	2,000
Tung Oil plants	33,159	...	33,159
Ornamental	25,974	1,314	27,288
Bulbs and Roots	472,185	...	472,185
Bulb Fibre	21 bags	...	21 bags
Grass Roots	1 bag	...	1 bag
Total	631,889 + 22 bags	9,286	641,175 + 22 bags

In returns showing the importation of fresh fruit from the Eastern States it will be noted that nearly twice as many cases of oranges are brought by the Trans. train to Kalgoorlie than are exported overseas from Western Australia. The quantity, however, 6,549 cases, is not large when one considers that annually upwards of 300,000 cases are produced and consumed locally in Western Australia.

Details are as follow:—

IMPORTATION OF FRESH FRUIT INSPECTED UNDER THE "PLANT DISEASES ACT, 1914," FOR YEAR ENDED 30TH JUNE, 1938.

Kalgoorlie—			
Bananas	3,946	crates	
Pineapples	82	cases	
Nuts	39	bags	
Passion Fruit	25½	cases	
Tomatoes	287½	,,	
Oranges	6,549	,,	
Mandarins	26	,,	
Grape Fruit	77	,,	
Cocoanuts	3	,,	
Lemons	449	,,	
Gooseberries	53½	,,	
Cherries	857½	,,	
Nectarines	759½	,,	
Plums	1,333	,,	
Peaches	1,651½	,,	
Strawberries	6	,,	
Loquats	7	,,	
Apricots	157	,,	
			16,309 packages.
Fremantle—			
Bananas	152	crates	
Pineapples	1,421	cases	
Nuts	4,684	bags	
Oranges	70	cases	
Grape Fruit	150	,,	
Gooseberries	480	,,	
Cherries	2,331	,,	
Nectarines	44	,,	
Plums	79½	,,	
Peaches	5	,,	
Olives	2	,,	
Cape Gooseberries	½	,,	
Mangoes	3	,,	
			9,422 packages.
Albany—			
Bananas	32	crates	
Passion Fruit	½	case	
Oranges	61	cases	
Mandarins	4	,,	
Grape Fruit	7	,,	
Gooseberries	5	,,	
Nectarines	4	,,	
Peaches	1	,,	
Loquats	1	,,	
			115½ packages.
Carnarvon—			
Nil	Nil		Nil
Total			25,846½ packages.

Though Western Australia is making a sustained and promising effort to supply her people with bananas there is still considerable leeway to make up, and the importations of fruit from overseas are mainly comprised of bananas. Particulars are as follow:—

IMPORTATION OF FRESH FRUIT UNDER THE QUARANTINE ACT FOR YEAR ENDING 30TH JUNE, 1938.

Bananas	4,383,300 lbs.
Mangoes	1,100 ,,
Mangosteens	300 ,,
Pineapples	2,100 ,,
Cocoanuts	72,400 ,,
Nuts	128,838 ,,
Total	4,588,038 lbs.

TOBACCO CURING EXPERIMENTS AT MANJIMUP, SEASON 1936-37.

A. SHARP, U.D.A.,
Tobacco Adviser.

INTRODUCTION.

With the object of investigating a number of curing problems which confront tobacco growers, and of trying out a more scientifically designed curing barn than had previously been in use in this State, a curing kiln was erected on the property of Mr. G. F. Combs at Jardee, during the 1936-37 season, and a series of curing experiments was initiated.

The size of the kiln was 10 ft. 6 ins. long, 8 ft. wide and 14 ft. high to the eaves. This height was sufficient to allow of four tiers of leaf being hung in the barn. The floor area was smaller than the usual commercial barn, but was large enough to ensure that the conditions inside it during the curing process would be similar to those which would obtain in a well-built commercial size kiln.

The framing of the barn consisted of 3 in. x 2 in. jarrah, lined on the outside with corrugated iron and on the inside with asbestos-cement sheets. The space between the linings was filled with jarrah sawdust in order to insulate the interior from fluctuations of the outside temperature. The roof was of corrugated iron lined inside with asbestos-cement sheets. The top ventilator consisted of an opening 8 inches wide running the whole length of the ridge of the roof. This opening was surmounted by a solidly constructed ridge-piece which could be raised or lowered according to the amount of ventilation required. The bottom ventilation consisted of two galvanised iron pipes sunk in the floor, running directly beneath the heating flues, and connected at either end to the outside air by elbows, the mouths of which could be closed or opened to any desired degree by shutters. An opening half an inch wide along these pipes, just under the flues, caused the incoming air to be thoroughly heated before coming in contact with the leaf in the barn. The heating system consisted of a brick firebox outside one corner of the barn, connected to an eleven-inch diameter sheet-iron flue pipe running round three sides of the barn and leading to an exterior chimney.

This barn, when put into operation, gave excellent results and proved to be extremely economical in firewood. The general design has since been copied by a large number of growers and has given general satisfaction. From the point of view of demonstrating the superiority of a scientifically designed kiln over the rather crude type previously in general use in this State, this barn has amply justified itself.

SCHEME OF EXPERIMENTS.

1. The first point on which information was desired was whether the relative humidity of the atmosphere in the curing barn could be kept sufficiently high during the yellowing process without the introduction of steam. Theoretically, the moisture given off by the leaf itself should be sufficient for the purpose, but some experienced curers maintain that the introduction of additional moisture, either in the form of low pressure steam from a boiler or by placing wet bags on the warm flue pipes, is beneficial. On the other hand, the writer's own observations had led to the suspicion that the excessive use of steam was responsible for a considerable amount of "sponging" of the leaf during the fixing of the colour.

2. The second point which it was desired to investigate was the relative merits of fast and slow curing. The rate at which the temperature and ventilation of the

barn can be increased during the fixing of the colour is a matter on which some doubt exists. Generally speaking, very slow increase of temperature tends to increase the amount of sponging in the leaf, while some curers maintain that fairly rapid rise of temperature with corresponding increase in the amount of ventilation spoils the texture of the finished product.

Arrangements were made to purchase mature, uncured tobacco leaf from Mr. Combs as required. It is desired here to express appreciation of the assistance which Mr. Combs rendered during the course of the experiments. In all, four barns of leaf were cured during the season, the first two being devoted to investigating problem No. 1, and the others to problem No. 2.

The 1936-37 season was an exceptionally hot and dry one, and as a result, a good deal of damage had been done to tobacco crops generally by scorching, rendering the leaf harsh and more than usually difficult to cure. The leaf purchased from Mr. Combs was of the "Hickory Pryor" variety, of heavy body, and a proportion of it showed signs of scorching owing to the harsh climatic conditions under which it had been grown. This damage became progressively worse as the curing season advanced.

The following are the details of the experiments and individual cures:—

Experiment No. 1.

To determine whether the amount of moisture given off by the leaf during the colouring process is sufficient to keep the humidity in the barn sufficiently high to allow this process to proceed normally, or whether the artificial addition of moisture is beneficial.

Cure No. 1.—The leaf was picked from 6 a.m. to 9 a.m. on Tuesday, 2nd February, 1937, strung on the sticks during the day, the barn being filled and the cure started by 5 p.m. The yellowing process was commenced at a temperature of 87 deg. with ventilators closed The temperature was raised very gradually until at 4 p.m. on the following day (Wednesday) it stood at 105 deg. During this time the wet and dry bulb thermometer readings showed a difference of 3 deg., indicating a relative humidity of about 88 per cent., which was maintained without the use of added moisture. By 7 p.m., 26 hours after commencement of the cure, the temperature was 112 deg. dry bulb, with wet bulb 8 deg. lower. At this stage the leaf was a pale pea-green colour, and the top ventilator was opened slightly. From then on the temperature was gradually raised and ventilation increased until at 10 p.m. on the following day (Thursday) it stood at 135 deg. with ventilators full open. The web of the leaf was dry by 5 a.m. on Friday and the temperature was then gradually raised to 160 deg. and kept there until 10.30 a.m. on Saturday when the midribs were dry and the cure completed. This cure took 89½ hours to complete. By the following morning the leaf had conditioned sufficiently and was removed from the barn and bulked away.

Cure No. 2.—The leaf was picked on Monday, 8th February, 1937, from 6 a.m. to 9.30 a.m., strung on the sticks during the forenoon, the barn being filled and the cure started by 1.30 p.m. The temperature during yellowing was kept as nearly as possible the same as in the previous cure, but from the beginning of the cure until half an hour after midnight on Wednesday, wet bags were placed on the warm flues in order to obtain as high a degree of humidity as possible. The difference between the wet and dry bulb readings during most of this period was not more than two degrees and was frequently less than one degree, showing practically complete saturation of the atmosphere. *The increased humidity had no effect whatever so far as accelerating the yellowing process was concerned.* The top ventilator was opened slightly at 3 a.m. on Wednesday, 37½ hours after commencement of

curing, and from then on the cure followed the same lines as No. 1. The cure was completed at 10.30 p.m. on Friday, 12th February, having taken 105 hours. Owing to the very hot, dry weather prevailing, some difficulty was experienced in getting the leaf to condition sufficiently to bulk, and it was not until Sunday morning that this operation was completed. It will be noted that this cure took 15½ hours longer to complete than did cure No. 1. This was due partly to the fact that yellowing was carried on longer in an endeavour to eliminate more green from the leaf and partly to ensure that a few very thick fleshy midribs were thoroughly dry.

The leaf from these two cures was bulked side by side in a small shed kindly made available by Mr. Combs. The bulks were examined on 14th May during damp weather, and were turned to allow of the absorption of a little extra moisture to facilitate handling during grading.

RESULTS OF EXPERIMENTS 1 AND 2 COMPARED.

The leaf was graded during the first week of July into six grades. The following are the gradings of the two cures:—

	Cure No. 1.		Cure No. 2.	
	Weight in lbs.	% of Total.	Weight in lbs.	% of Total.
Grade 1	8½	4.77	½	0.32
Grade 2	37	20.73	10½	6.78
Grade 3	48	26.89	62	40.00
Grade 4	44	24.65	32	20.64
Grade 5	6	3.36	15	9.68
Grade 6	35	19.60	35	22.58
Total	178½	100.00	155	100.00

Grades 1, 2 and 3 were classed as "Bright Mahogany," Grade 4 as "Inferior Bright," Grade 5 as "Mixed Low Grades," and Grade 6 included all leaf showing the least tinge of green.

A study of the above figures reveals that 25.5 per cent. of the leaf from cure No. 1 was placed in the two top grades as compared with only 7.1 per cent. from cure No. 2. It is difficult to estimate just how much of this loss of brightness in cure No. 2 was due to the method of curing and how much was due to an extra week's exposure of the leaf to the extremely unfavourable weather which was experienced at the time. The result, however, would appear to indicate that the application of artificial means of saturating the atmosphere of the curing barn does not accelerate the yellowing process and does not cause any increase in the proportion of bright leaf. It is quite possible, however, that this conclusion may have to be qualified somewhat, inasmuch as it applies to a curing barn which was carefully built so as to prevent as far as possible the escape of moisture-laden air and its replacement by drier air while the ventilators were closed. It was found that a relative humidity of about 88 per cent. could be maintained without difficulty in the experimental barn during the initial stage of the cure. There is little doubt that comparatively few grower's barns with bag walls would be capable of maintaining such a high degree of humidity without the application of extra moisture. *This experiment has shown*, however, *that a relative humidity of the order of 88 per cent. is quite sufficient for normal colouring of the leaf, and that complete saturation of the atmosphere is neither necessary nor desirable.*

Experiment No. 2.

This experiment was designed to determine whether fairly rapid raising of the temperature, together with ample ventilation, during the process of fixing the colour, gives better results than very gradual increase of temperature and ventilation.

Cure No. 3.—The leaf was picked between 6 a.m. and 9 a.m. on Monday, 15th February, 1937, and was strung on the sticks during the day. The barn was filled and curing started by 5 p.m. The yellowing of the leaf was commenced at between 80 and 90 deg., the temperature being gradually raised to 100 deg. in 24 hours. No moisture was added to the barn. The leaf was sufficiently yellowed by 7 p.m. on Tuesday, 26 hours after curing had commenced, and the top and bottom ventilators were then opened very slightly. Temperature was then raised very gradually and ventilation increased very gradually until 5 p.m. on Wednesday, 48 hours after commencement of curing, temperature was 125 deg. and ventilators full open. Slight signs of sponging were observed during this period. The temperature was 135 deg. and the web of the leaf dry at 9 a.m. on Thursday, 64 hours after commencement of curing. Temperature was then raised gradually to 160 deg., at which it was kept until the midribs were dry. The cure was finished at 4.30 p.m. on Friday, the total time taken being 95½ hours. Trouble was again experienced in getting the leaf into condition for bulking, and this was not accomplished until early on Monday morning, 22nd February.

Cure No. 4.—The leaf was picked between 6 a.m. and 9 a.m. on Tuesday, 23rd February, 1937, and was strung on the sticks during the forenoon. The barn was filled and the cure started by 2 p.m. Yellowing was commenced between 80 and 90 deg. as in the previous cure, but was allowed to go farther before ventilation was begun. The ventilators were opened about one quarter full at 3 a.m. on Thursday, 37 hours after curing had commenced, with temperature at 120 deg. Within half an hour ventilators were full open, and by 4.30 a.m. the temperature was up to 126 deg. Temperature was then raised fairly rapidly to 135 deg., and by 6 p.m. on the same day the web was dry, 52 hours after commencement of curing. Temperature was then raised gradually to 160 deg. at which it was kept until the midribs were dry. The cure was completed at 2 p.m. on Saturday, the total time for the cure being 96 hours. The leaf conditioned very slowly and was bulked away the following Monday morning.

RESULTS OF EXPERIMENTS—3 AND 4 COMPARED.

The leaf from cures 3 and 4 was bulked alongside that of cures 1 and 2 and treated in a similar manner. It was graded during the first week of July and the following table shows the result:—

	Cure No. 3.		Cure No. 4.	
	Weight in lbs.	% of Total.	Weight in lbs.	% of Total.
Grade 1	...	...	...	...
Grade 2	11½	5.74	5½	2.76
Grade 3	31	15.46	34	17.04
Grade 4	92	45.88	81	40.60
Grade 5	4	2.00	18	9.03
Grade 6	62	30.92	61	30.57
Total	200½	100.00	199½	100.00

These grades have the same connotations as in the first two cures.

It will be noted that there is a distinct falling off in the quality of the leaf obtained from these two cures as compared with cures 1 and 2. This was principally due to the seasonal conditions experienced. All growers reported that their leaf became increasingly difficult to cure, and the proportion of "Bright" leaf less, as the season progressed.

It will be seen that cure No. 3 showed a rather higher proportion of bright leaf than No. 4, but it is believed that this was due more to the condition of the leaf when picked than to the difference in the method of curing. *It was evident during the curing that there was more liability to sponging when temperature and ventilation were increased very gradually than when such increase was comparatively rapid.* There is little doubt that this tendency would be more pronounced in the old type of kiln in which no provision is made for preheating the incoming air.

Close examination of the leaf during grading failed to reveal any significant difference in texture between the two cures. *It would appear*, therefore, *that comparatively rapid raising of the temperature during the fixing of the colour, combined with ample ventilation, reduces the risk of sponging without materially affecting the texture of the leaf. It will be observed also that slow fixing of the colour did not reduce the proportion of green leaf.*

It will be noted that the proportion of leaf graded as "Green" appears to be unduly high in all the cures. This was due principally to the standard of grading being much more strict than is usually the case in commercial grading. Every leaf with the slightest tinge of green was placed in this grade although quite a large proportion of it would probably have been saleable. The whole of the leaf in Grade 6 was packed away in a wooden case and will be examined and regraded after twelve months storage.

CARE AND FEEDING OF CHICKENS.

(G. D. SHAW.)

The problems of mating and incubating are so many that they can only be overcome by experience, but the beginner can care for and manage successfully a flock of chickens should he pay strict attention to the details. When we leave the broody hen to hatch and mother the batch of chickens our only problem is to see that the hen and her brood have sufficient food, clean fresh water and plent of grit. These essentials to the successful growth of the stock, should be always handy and the hen can then be left to herself and she will do the rearing with a minimum of labour and worry to the owner. It is when the chickens are hatched in the incubator or are purchased and delivered to the farm that we are likely to meet trouble in the rearing. The transferring from the incubator or the packing boxes to the brooders is a dangerous period in the life of the young chick.

BROODERS.

A brooder is a device by which chickens are reared without the care of hens. They may be of two systems—

(i) Cold brooders.
(ii) Hot brooders.

(i) The cold brooder is so made that it retains the heat of the chick and so keeps the chick warm and comfortable without the aid of artificial heat

(ii) The hot brooder is one which is warmed by the application of heat and does not depend on the animal heat of the chickens in order to give the necessary comfort and warmth.

(i) *Cold Brooding.*—When one intends to cold brood the chickens, care should be taken to see that the chicks are well fluffed out before the transfer from the incubator or the travelling boxes to the brooder. Always purchase a reliable make of brooder. Do not commit the chicks to the mercies of the home-made brooder. One must emphasise that the majority of home-made brooders are the inventions of those who are not cognisant with the requirements of the day-old chick and the use of these makeshifts will entail work and will cause worry and loss of chickens out of all proportion to the value of the fuel that has been saved. If it is the intention to make the cold brooders on the farm, a model of a proved cold brooder should be used as a pattern.

The cold brooder should be designed to make provision for warmth, comfort, ventilation and safety from ground draughts.

(ii) *Hot Brooders.*—There are many systems of hot brooding of chickens.

(a) First we have the small units which are used with success in every district. They may be heated by an oil lamp which heats the air round the lamp and then directs the heated air into the brooder.

(b) Secondly we have the hot water system of brooders. These brooders are on the sectional principle whereby the water is heated and circulated throughout the shed above the chicks. The shed is partitioned off so that the chicks can be kept in small numbers and the ages kept separate. Brooders which are heated by the circulation of hot water may be in small units or they may be continuous in their application. When they are in small units the water is conveyed in pipes over the chicks similar to the hot air, and, when the water cools, it gravitates back to the heater. Hot water brooders have an advantage in that should the lamp be extinguished accidentally the heat of the water will be sufficient to keep the hover warm for a fairly long period and the dangers from chilling are thereby lessened. When the continuous hot water system of brooding is installed the water pipes are run throughout the length of the brooder house and the house is partitioned into the desired sections, each section being operated as a single brooder compartment It has one disadvantage in that the whole system must be heated even if there are only sufficient chicks to fill one compartment.

(c) Thirdly, we have the battery brooder. The battery brooder is so named because the brooder is arranged in batteries or tiers one above the other. Each battery is heated with a single heat unit and is generally fitted with rollers for convenient movement. Owing to the confined nature of the battery large numbers of chickens can be handled in a minimum of space.

This article is to cover the use of the small brooders and for those who favour the rearing of chickens in small numbers. Whilst agreeing that cold brooding is satisfactory in the hands of those who understand the principles, it is nevertheless suggested that greater success and easier management are possible with the use of hot brooding facilities.

Small brooders are satisfactory when one is dealing with a limited number of chickens and one can extend the use of small brooders to meet the demand of many hundreds. One advantage of small units is that the chicks are under closer observation than when they are in large numbers. The satisfactory unit

is about 75 to 80 chicks. These can be contained under the standard 100-chick unit. When purchasing a brooder, estimate the capacity to be 75 per cent. of that advertised. One can place 100 day-old chicks under a hundred brooder, but owing to the quick growth of the chicks, by the time they are three weeks old the brooder is overcrowded.

In all brooders there is a hover and a nursery, although in many cases the nursery is eliminated and the shed in which the brooder is placed is divided into runs which act as a nursery for the young chicks. If the brooders are to be placed outside it is advisable to have the hover and the nursery connected in one unit. Brooders must be well heated, and there should be a perfect union of the heat, top, side, and bottom. Such fusion of heat will be obtained inside a shed having good ventilation, and covered with litter on the floors. Hot-air brooders are operated on the principle that the air is heated by an oil lamp, and is then directed upwards and into the hover on top of the young chicks. It is there diffused and in cooling falls down on the backs of the chickens and so keeps them comfortably warm. *No matter what may be the outside conditions, an efficient brooder will be able to maintain an even heat inside.*

Battery brooding is practised when there are large numbers of chicks to be handled. These brooders are erected in batteries and are so arranged that the upper compartments contain the youngest of the chicks, and as they grow older they are transferred to a lower compartment. They may be heated with either oil or electricity. The housing for battery brooders must be on different lines from that required for the other types. The batteries are generally operated inside and the feeding also must be altered to compensate for the lack of the natural sunlight. Batteries may be used for the starting of the chicks, after which, at about a fortnight or three weeks, they are transferred to other hot brooder facilities or under cold brooder. Batteries may be used to grow the chicks until they are twelve weeks old, although this practice is not advocated here in Western Australia owing to the natural facilities available for the rearing of young stock. This article will not deal with the operation of battery brooding.

Litter.—The brooder floor should be covered with some form of litter. Those who are fortunate to have a supply of clean sand can use it with advantage. The sand over the floor will keep the chickens occupied and the small particles of cracked grain will be buried sufficiently deep to give all the exercise desired. If sand is not available, the use of finely cut straw is advised. One can use chaff, and even the use of old leaves and small cut rushes will be satisfactory. The main essential is to provide a covering for the floor and see that it will not be too deep. ALL LITTER MUST BE DRY. Any possibility of dampness in the litter will be the cause of trouble and should be avoided.

The brooder itself should be placed in a position which keeps it free from the cold ground draughts and in all cases it should be surrounded by a fence made out of wood or iron. A space of about eight inches should be allowed between the fence and the brooder. It is in this space that the chicks are confined for the first three days. Under the brooder there must be some form of litter and the best littler for under the brooder is clean dry sand and chaff. When the chicks are used to the heat and can find their way from the hopper to the brooder, the fence may be enlarged or one side may be taken away and the chicks allowed to roam.

Generally the best means of feeding the chickens will be to have the hopper form one or more sides of the fence until the chicks are trained to know where the heat is. The hopper can then be moved further away and the chicks can then travel from the brooder to the hopper. The remainder of the fence acts as a breakwind against the ground draughts and should be kept in place until the chickens are perching.

Temperature of Brooders.—The proper warmth is of the utmost importance. It is recommended that the temperature should be about 95 degrees, but this may have to be altered to meet the changing atmospheric conditions. It is never advisable to rely on the thermometer. The attitude of the chickens under the brooder is the best guide. The chickens themselves will, by their crowding or otherwise, inform the attendant whether the heat is sufficient or not.

Make the chickens spread out. If there is any tendency to crowding it should be evident that the heat is too low, and, no matter what the thermometer reads, it is essential that more heat should be applied so that the chickens spread away from the source of heat. A common symptom of insufficient heat is the attraction to the chicks of the light of the lamp. Many will mistake this for curiosity, but the real cause will be that the chickens are cold and are crowding the lamp.

Placing the Chicks under the Brooder.—When the chicks arrive, or when they are to be transferred from the incubator to the brooder, great care should be taken that the chickens suffer no chill during the process. See that they settle down quickly. This will inform the attendant that the heat is correct. If they crowd the heat or huddle together, turn up the lamp a little, so that the chicks are forced to spread out. The brooders should be visited about five minutes after the chicks are placed under them and by this time they should be well spaced under the hover and more or less resting. When they are settled down they should be left and not disturbed. Under no consideration should you count the chicks on arrival. This is distinctly dangerous. When one orders day-old chickens from a hatchery one is at least placing confidence in that hatchery to supply good chickens, therefore have confidence that the hatchery will send the correct number. The chickens arrive in a close box which has been filled to crowding, and the heat inside the box is very high. When the box is opened the heat escapes and the cold outside air will strike on the backs of the chickens. If this striking is of long duration (long enough for you to count 100 chicks), those in the box will catch a chill and eventually go sick; therefore, count them several days later instead.

Feeding.—It has often been suggested that the chick, when born, has sufficient food for sustaining life for at least three days after birth (it is this advantage which has made possible the transportation of day old chicks over long distances) and that no food should be given to the chicks until the fourth day. It has now been proved that the chicken can be given food as soon as it can pick and that no harm will come of the practice of feeding chickens as soon as they are placed in the brooder house. Those which have arrived from the hatcheries are at least two days old and should be fed immediately they have settled down under the brooder.

The feeding rations for chicks are many and varied, and it is necessary to give special attention to the brooder reared chicks because they are confined and they must live by their own efforts—there is no "cluck" in a brooder.

During the first few days the chicks must be taught not only where to find the heat, but also to eat and care for themselves.

Before the chicks arrive, care should be taken to see that everything is in readiness for the correct feeding and watering. In approaching the feeding of chickens it may be advisable to explode some of the old-time methods of rearing chickens, the first of which was the feeding of hard boiled eggs to the day olds. This is not only expensive but extremely dangerous, besides which the eggs which were recommended for the chicks were the incubator infertiles. The incubator infertile eggs may or may not be carriers of the dreaded Pullorum Disease.

Chickens should be fed the simplest of wholesome foods. They do not need the additions of spices which are advocated by the proprietors of patent foods. When chickens are reared under natural conditions they are fed in a natural way. They can partake of green feed when they desire. They have access to grains and insects. When we are desirous of rearing as near to nature as is possible we should endeavour to imitate nature in all respects. It is unnatural to confine the chicks within a house having all the sides enclosed. No advantage is gained with such confinement. All rearers of chickens should allow the chickens to have access to mother earth as soon as possible. If the brooder is heated properly, the chickens will be forced to get away from the heat and in doing so they will eventually be noticed to have their heads outside the curtains of the brooder but their bodies inside. We have then a situation which is near to that practised by the hen and her brood. When she sits down the chickens nestle under her and shortly one will notice the heads showing through the feathers of the mother's body; but keeping the body warm where it is wanted (over the lungs) with the head of the chick out and therefore breathing fresh cool air. The same should apply to those chicks which are confined to brooder management. The heat should drive the heads outside the curtains and the body should be inside the brooder.

The chickens should also be allowed to run outside the brooder house in all weathers. Rain will not hurt them providing they have been educated to know where to find the heated brooder. If the chickens get wet they will run under a brooder which will dry them by its own heat. They will not then chill. When the broody hen is wandering with her clutch she will at times be caught in a shower. Her chicks will also get wet, but in this case she will not run for shelter. She will "cluck" and the chicks will come to her and go under her wings. The chicks are wet and yet she sits in the rain and on the wet earth and drys them by applying the heat of her body where it is most required—on the lungs. One never notices many deaths when the hen is rearing a brood out in the open. If, on the other hand, the brooder is kept at medium heat and depends somewhat also on the animal heat of the chick to give comfort, the chick, when it gets wet, will chill before it becomes dry; because the heat of the brooder is insufficient to do the work.

When feeding young chicks you are now advised to forget the old practices of feeding many small meals a day. The old idea was to give plenty of small feeds during the day—to keep the chicks more or less hungry so that they would always be ready for the next meal. You were advised to give many mashes and then top off the day's feeding with cracked grain in the litter for an evening meal. Plenty of work for the attendant and a system which eventually led in making the rearing season one of hard work and impatience, neither of which was good for the well being of the stock. Now-a-days, we can depart from the laborious ways of olden days and make the rearing season easy and pleasurable.

There is no need for the many meals a day which were rationed out by the attendant. One can feed efficiently on dry mash all day and the dry mash can be made to contain all the foods necessary for health and correct growth. One of the most important points to notice when feeding is to see that there is sufficient feeding space so that *all the chicks can feed at one and the same time.*

If you are going to use hoppers you must provide hoppers large enough to allow all the chicks to approach the hopper at the same time. If the hopper, or feeding space, is restricted, it will be found that some of the chickens (the most modest) will be deprived of the necessary food for maximum growth and health. The bullies will always be able to get the titbits and the shy chick is therefore starved of the necessary ingredients for its requirements in building good body and bone formation.

It is advisable to feed the chickens on a dry mash until they are eight weeks old and thereafter they should be fed a wet mash in the morning (the same as fed to the hens) a dry mash in front of them all day long (a mixture for their particular requirements), and to give whole grain at evening followed by chaffed up green feed.

When feeding chickens it must be understood that each respective breed should be fed a ration for that particular breed. Heavy breeds will not do as well on the ration which is efficient for the light breeds. We are getting back to the principles as stated in "How to Feed Your Fowls," pages 465-470, *Journal of Agriculture* XIII. (2nd series), No. 4, December, 1936. It was there stated that we have three different types of fowls used for utility purposes and those three types require three different feeding rations.

The same with the chickens of those three different types. The light breed does not need as much food as the heavy breed and it does not require as much protein and bone forming foods as the heavy breed. The light breed bird is to weigh 4 lbs. at six months and the heavy breed must weigh 5 to 6 lbs. in the same time. They must have not only different quantities but also different foods. It is therefore extremely necessary for all breeds to be reared separately, otherwise maximum rearing results will not be forthcoming.

In practice it has been found that the young chick requires more protein during the first weeks of life than at other periods of its existence. We must therefore make allowance for this requirement.

The foods recommended for the growing chick are bran, wheat meal, pollard, meat meal, buttermilk (dry), skimmed or separated milk, bone meal, oilcake or key meal with or without the addition of cod liver oil or pilchardine.

If maize can be bought at reasonable prices, it can be used to advantage. Unfortunately, maize is not generally used as a chick food in Western Australia. We are dependent on wheat and its byproducts.

Meat meal is the most important ingredient of the feed. In many parts of the wheat belt farmers supplement the feeds with the fresh flesh of rabbits. While it is desirable to use all the foods abounding on the property, it should be understood that the fresh meats are not high enough in their protein content to give satisfaction and the farmer must still feed a percentage of the concentrated meats known as meat meal. When one is fortunate enough to have a supply of fish meal available, use of this ingredient will give advantages which are unavailable in the other protein concentrates, but until fish meal is procurable in this State we must depend on the use of meat meals and dry milk powders.

Milk Powders.—These foods are a source of minerals and protein and should always be incorporated in all rations whether they are for the feeding of chickens or older stock. We have several brands of milk powders and all can be used with satisfaction. Skim milk and liquid butter milk—these two forms of milk are often to be found on the farm and are recommended. Whole milk, on the other hand, is of little use owing to its fat content. The cream should be skimmed or separated from the milk before use.

When we are using liquid milk we must remember that it is so much water and IS NOT A SUBSTITUTE FOR DRY MILK POWDERS OR MEAT MEAL CONCENTRATES.

The use of milk in any form is a definite help in combating some of the most persistent troubles of chicks.

Bone Meal.—This ingredient is necessary for the building of good bone formation and should be included from the first feed until the pullet has completed her growth at about 15 months of age. Recent researches have suggested that the bone

meal need not be included until the chicks are eight weeks old but the practice of including it from the first meal ensures that the chickens can use it if required. Chickens given high percentages of both meat meal and bone meal from the first meal will grow faster during the first four weeks than those which are fed low percentages of these two meals. The rations given below include the meat meal and the bone meal in average proportions.

Oilcake and key meal are the product of the coconut after the oils have been extracted for foods and soaps and are an excellent addition to the rations. The oil cake is pressed and must therefore be soaked before use. It is therefore included in the wet mash only while the key meal being in the form of dry grounds is used in the dry mash Codliver oil and pilchardine are two oils which are recommended when the chickens are reared in confinement or where there is a shortage or absence of green feed. For Battery brooding one or the other must be incorporated in the mash.

As it is the intention to advocate rearing the chickens in the open runs where both sunlight and green feed can be supplied, cod liver oil or pilchardine are not included in the feeds for the chickens.

The following are the mashes recommended for day old chicks until they are eight weeks old:—

For light breeds—

5 parts bran
3 parts wheatmeal
½ part meatmeal
¼ part dried milk powder
¼ part bonemeal
½ part keymeal

or 4 parts bran
4 parts pollard
½ part meatmeal
¼ part dried milk powder
¼ part bonemeal
½ part keymeal

For heavy breed chicks the meat meal and the bone meal should be slightly increased as follows:—

Meatmeat 11/16 parts
Bonemeal 5/16 parts.

For the evening meal, gristed grain is spread amongst the litter. If a large quantity of mash is mixed before the chickens are due to arrive there will be no rush when they do come. The hoppers can be filled from the storage bins and the chicks need little attention in feeding for the first week.

The first meal should consist of dry bran placed on a sheet of paper and the bran should trail towards the hopper. The chicks will follow the trail and will soon find the feed in the hopper, after which they can be left to their own devices. They will not gorge, neither will they starve if there is enough feeding space for *all to feed at one and the same time.*

In the early afternoon they should be given cracked grain in litter which should not be too deep. Greens can be given to them as soon as they will eat of them. The greens should be chopped up very small at first but after the first weeks they will be able to tear apart the greens as supplied to the older fowls.

Fresh water must be before them at all times. Whenever the water runs out take care to see that the chickens have a good crop full of food before the water is renewed. Excess of water on an empty crop will cause internal disorders.

Shell grit and fine grit.—At all times there must be an ample supply of shell grit before the chickens. Some advocate that the fine shell grit be given in the rations, but in this article it is advised to have the fine grit in a trough where the chicks can partake when they desire. The natural instinct of the growing chick will direct it towards the grit if it can obtain the supply at all times. It is not desirous of forcing the grit into the bird when perhaps the chick does not require the supply at that particular moment of feeding.

Apart from the fine shell grit hard flint-like grit is also necessary to the health of the young chick. The fowl has no teeth and the means of grinding the food is by the strong muscles of the gizzard. In order to assist the grinding of the food hard grist is an advantage. Therefore have both shell grit and hard stone or flint grit before the chicks at all times. Keep the chickens growing all the time and any that lag behind *should not be graded* into a younger batch *but should be culled.* Cull from the first day.

Culling.—When the chickens arrive they apparently show few defects. The hatchery has, in good faith, selected the best available as seen at the time of birth, but the short period which may elapse between the selection and the receipt of delivery will have an effect on the chickens. Those which are not too strong will begin to show the faults at about three days. These chickens were never made to live long, but it has been impossible to find them during the first few days. After a few days under the brooder it will be seen that some are not progressing as they should. They will have a round dumpy body and the wings, such as they are, will not be tight against the body; they will have the tendency to hang aimlessly. When their sisters are eating ravenously they will not even pick at the food; all they will do is to rush from one group to another. If picked up and handled they will have an empty crop. These chickens are soon going to die and should be culled as soon as recognised.

As time passes, it will also be noticed that others will lag behind their fellows. These are further culls. If you do rear them to the laying stage, they will never be able to play their proper part. Kill them off as soon as possible.

At about eight weeks old one will notice a distinct difference in the sizes in the flock. Few will be well behind the other chickens in size and activity. They will be slow in feathering, their heads will be elongated, and the eyes will look dull. These also should be culled. The attendant should never hesitate to kill any chick which will not keep pace with the average of the rest of the flock.

Weaning.—When the chicks are growing they will need less heat week by week, but it is dangerous for one to turn out the heat suddenly. Any reduction in heat must be gradual and cover a period of many days.

If one watches closely the behaviour of the chicks under the brooder one will see the tendency to get further and further away from the heat. It will often be noticed that the largest and strongest will be sleeping outside the brooder at about four weeks old. Some will be even perching on the top of the brooder. When this happens the chickens are ready to be taught how to perch.

The brooders should be placed on a slightly raised platform and the chicks made to go under the first night. The lamp should be turned up fairly high, as the air coming from under will cool the brooder considerably. The platform should be made of a slatted floor 3 x 1in. timber spaced at one inch between each piece. This will give an effect similar to perches closely spaced. When the chickens take to the brooder and the slatted platform they should be left undisturbed for two or three days, after which the slats are widened out nightly. The distance between the slats should *never be wide enough* for the chickens to fall

through to the floor. When the chicks take to the top of the brooder for the second time, it is advisable to then place the proper perches above the brooder. It will then be noticed that those chicks which had started to perch on the brooder will take to the perches, and at about five or six weeks the whole of the chickens have left the brooder and are safely on the perches without handling. When the majority have taken to the perches the lights can be extinguished, but do not remove the brooder for a week or more until it is noticed that the chicks are evading the cover of the hover. If the farmer will practise this idea it will be noticed that the chickens are not handled from the time they are placed under the brooder at day old until they are caught for placing in the laying sheds. There may be difficulties in the way of adopting this idea when one has the large colony hover brooders, but the principle can be used just the same. In this case the perches will have to be placed at the back or on the side of the brooder hover and the chicks attracted to the perches by the use of inclined run ways directing them upwards. It should never be necessary for the farmer to handle the chickens on to the perches. If one must resort to handling, one shows some fault in general management which could easily be remedied with a little forethought.

Feathering.—At about six weeks old it will be noticed that the light breeds will be feathering quickly, but the heavy breeds will take a few weeks longer to complete their furnishings. The feeding up to this stage has been dry mash. At eight weeks you are advised to begin with the wet mash feeding in the morning, dry mash all day, and you can begin to give the whole grain at evening, followed by green feed. The feathering of the bird is the best guide to its condition, and incidentally, it is also the best guide in showing you whether you are feeding the proper balance in the rations. The chicken at this stage is a very lively individual and must be using a great proportion of the carbohydrates of the ration for providing the energy used in its activity. You must therefore reduce slightly the proteins, and the simplest way to accomplish this is to reduce the proportions of meat meal in the rations. It is only a slight reduction, but nevertheless it must be reduced. If this is not followed you will shortly find that the chickens are rushing to maturity, having neither size nor stamina. But if the protein is reduced slightly the stock will continue to grow without danger of early maturity and early laying of small eggs. We have a clear guide as to the proper requirements of protein from the beginning of the feathering. If the percentages of protein are correct, the feathers will be very close to the body—called tight feathering. If, on the other hand, the feathers are loose, i.e., they look like a cushion and they lift from the body with the slightest of breezes, it is then evident that the protein is too high and must be reduced at once.

The look of the feathering is the only guide we have which tells us whether the percentage of protein is correct or not. As the feathers are showing up well at about ten weeks, we have an early guide also. But, if we are going to wait until the chick is about four months old, we have delayed too long to correct any fault, and it will be found that the correction, if made, will have little if any effect in resisting early laying.

The protein must be always controlled with the one object in view, and that object is maturity at the correct age. In light breeds the correct age of maturity is approximately 26 weeks, and 28 weeks for the heavy breeds. There is one factor which must be mentioned when we are referring to the age at maturity, and that is the strain. It is no uncommon thing to find that one strain will nature earlier or later than another strain, so that when we are so balancing the feeds to obtain the correct maturing age we are not to be too definite. The condition and the size of the birds must be examined to estimate

whether the strain is of the slightly early maturing or otherwise. It is of course realised that this difference in maturing is not going to be extended over a wide range of weeks. If one feeds a ration which will place bone and condition where it is wanted, and the feathers are tightly clinging to the body, one will automatically rear the stock to lay at the age which is the best for each and every particular strain of birds.

Feeding after Eight Weeks.—When the chicks are finished with the heat and are perching, they may be treated with the same management as given to the rest of the flock. They are to be fed the same wet mash, even to taking it from the common mixing trough. Give them as much wet mash as they will eat but do not leave any lying round for the pullets to play with. After they have been fed the morning mash they can be left to their own desires as to feeding. The dry mash is in front of them all day so if they feel hungry they can obtain their requirements without the bother of separate feeding times. At midday the chickens should be given a supply of chaffed greens. These greens are relished by the chickens and are one of the most important of the foods. They contain vitamins necessary for the welfare of the stock.

The next meal which is given by the attendant will be that of grain. This is given at about 3 to 3.30 p.m. Early evening feeding as this allows the attendant plenty of time to attend to the rest of the flock. After the grain see that the chickens get plenty of chaffed up greens.

Feeding at Sixteen Weeks.—At sixteen weeks the pullets, as they are now called, should look very even in size and type. You should have been culling any that have fallen behind the rest of the flock. The feathering should be "tight." If the feathering is loose you have little chance of remedying early laying, but you can assist in putting on more condition. To place on more condition you must reduce the protein in the rations. You can even go to the extent of withdrawing all the meat meal from the rations until the stock have built up that condition so desired. BUT NEVER REDUCE THE MILK UNDER ANY CONSIDERATION. Milk, whether dry powder, or liquid, is a great conditioner and is not liable to force the chickens to maturity.

As soon as the pullets show their intention of approaching the nests for laying, the ration must be altered to one containing all the ingredients which are necessary for growth, the replacement of new tissue, and the production of plenty of eggs of good size. The pullet is going to grow for another twelve months and you must be prepared to feed for that growth.

Early Laying.—No matter how correctly we may mix our feeds we are going to have some pullets start laying eggs too early. In this case we are not to change the rations of the flock.

When it is suggested that the light breeds should begin laying at about 24 weeks of age, care must be exercised to see that the MAJORITY lay at that time. It is of little use attempting to obtain uniformity in the beginning of the lay. Some birds mature earlier than their sisters and some are sure to take a longer time than the average. What must be understood is the early average of the flock, not that of a few individuals.

If one is confronted with the too early maturity of the flock, it is desirable to so feed the birds that the condition of those laying is not endangered. As the pullet must still keep growing and at the same time lay plenty of eggs the feed must be able to perform those two functions.

DON'T REDUCE THE FEED WHEN YOU HAVE TOO EARLY LAYING. This is distinctly dangerous. The pullet, if it is from high producing stock, must lay when it reaches maturity and if through any misjudgment of feeding the pullet

begins to lay too early, any reduction of food will cause the bird to draw on the body for the materials for the eggs. The eggs must come and they must be made from something. Generally they will get their needs from the food supplied but if that food is altered in any way from the egg forming ration the *pullet will not cease to lay but will weaken her constitution owing to the draw on it for the eggs.*

Do not follow the starvation feeding practices when you are troubled with early laying. What must be done is to try and assist the pullet to meet in every possible way, the demands for eggs and at the same time allow for growth of her body. When troubled with early laying slightly reduce the meat meal and increase the buttermilk. This slight reduction will assist in slowing up the production and the extra buttermilk will give continued growth to the bird. You must never try to stop the early laying. In endeavouring to stop the laying you will cause danger to the flock.

Late Maturity.—On the other hand it is sometimes noticed that the pullets although they seem to have reached maturity and should be laying, are not producing as they should. This time we have an entirely different complexion. The non-laying may be due to too little protein in the feeds. It is not sugggested that the rations are deficient in proteins to any great extent but that it is not quite sufficient for the requirements of both body formation and egg laying. When the pullets do not come up to expectations in laying, it is a good plan to increase the proteins as much as 50 per cent. for two or three days and then fall back to the base. After four or five days following the increase in protein it will be possible for some response to be noticed. If the laying increases you may be sure that the rations can be augmented with a little increase in the protein but NOT TO 50 PER CENT. ALL THE TIME. If on the other hand there is no response to the extra protein you may be sure the birds have not yet reached maturity and are not yet ready to begin laying.

The pullets should be carrying a small amount of fat. There should be a thin layer at the rear and it should be possible to keep that layer of fat. But when an excess of fat is showing there is a danger of heavy loss in production.

Feeding from 6 months onwards is dealt with in the article "How to Feed Your Fowls," *Journal of Agriculture of Western Australia*, Vol. XIII. (2nd series), No. 4, December, 1936, pages 465-470.

EROSION AND SOIL CONSERVATION.

By G. V. Jacks and R. O. Whyte.

(Imperial Bureau of Soil Science Tech. Communication No. 36, 1938, pp. 206, Price 5s.)

During the past five years the question of soil erosion and the need for soil conservation has been constantly before the public through the Press and through scientific and popular literature. Probably the reason for this publicity has been the activity in the United States of America where a combination of circumstances has forced home the seriousness of the problem and the urgent need for combative and conservation measures. The spectacular dust storms of the western prairies left no doubt in the public mind that the dust demon threatened much of their land. A complete organisation was commissioned, and, backed by appropriate legislation and finance, undertook a reconnaissance survey of the nation which proved the situation to be alarming. About one quarter of the arable land

of the Union had been virtually destroyed as far as arable farming was concerned and a large proportion of the remainder, as well as range and forest country, had been severely damaged.

The accurate data obtained in the United States of America and reported all over the world left no doubt that erosion and soil conservation are world problems and engendered a public realisation that immediate action must be taken. This realisation is reflected by the investigations, educative programmes and ameliorative measures which have been initiated all over the civilised world. The review of Jacks and Whyte presents a valuable summary of the situation in most countries of the world and mentions the legislative action and conservation measures taken.

It must not be thought that the problem of soil erosion, or even the use of control measures, is of recent period. Soil erosion, resulting from over cultivation, over grazing, forest burning and destruction of vegetation on the watersheds, is probably of similar antiquity to man. The decline and decay of civilisations may, in many instances, be correlated with soil erosion. For instance, in the Mediterranean region fertile cornfields of 2,000 years ago are now North African deserts, deforestation in the Pyrenees has caused catastrophic erosion and once populous districts of Syria now support only a poor nomadic population. Antioch, a garden city of 400,000 people at the time of Christ, is now a miserable Syrian town of 30,000 inhabitants. There is no evidence of climatic change during this period.

Civilisation has been a contributory cause in many countries. Thus, British administration in Africa and India has largely eliminated tribal wars, the depredations of raiders and wild beasts and has promoted expansion of crops and herds with soil exploitation and consequent denudation.

And control measures are no new things. Between 1861 and 1935 some 317 million francs have been spent in French Territory on the reforestation of over a million acres and, of this amount, 57 million francs have gone into corrective works. Japan is a country of highly erodible soils and topography and torrential rainfall, yet erosion has been effectively held in check by corrective measures regardless of cost. For the past 150 years check dams have been used to supplement the policy of reforestation in the control of floods and erosion. For centuries the danger of national disaster immediately control measures were relaxed has been recognised and an exemplary technique for combating soil erosion under Japanese conditions has been developed by foresters and engineers.

By contrast, the neighbouring nation, China, is an example of the terrible effects of the ravages of incompletely controlled erosion; disastrous floods, famines and desolation. It is probable that Chinese farmers have done more erosion control work over thousands of years than any other people in the world, but there has been no permanence to the results on account of failure to recognise that control work must commence at the eroding sites in the upper watersheds. The policy of *laissez faire* and the farmers' inherent fatalism has resulted in the acceptance of a condition which could have been obviated by national organisation and co-operative effort as exampled by Japan.

The story repeats itself as one reads through the chapters: some countries making a serious attempt at control and others following the policy of *laissez faire*. The secret is early control and prevention rather than cure as the costs of reclamation increase by the square of the initial damage.

L. J. H. TEAKLE,
Plant Nutrition Officer.

THE OFFICIAL PURE BRED DAIRY CATTLE PRODUCTION RECORDING SCHEME, 1937-38.

G. K. BARON-HAY, Superintendent of Dairying, and G. SLATER.

During the twelve months ended 30th June, 1938, 333 cows completed their test under the Official Herd Recording Scheme, the results being shown in Table 3. The number of cows submitted for test was 356, but 23 cows were either sold or withdrawn owing to sickness before having been under test for 150 days and consequently have been omitted from all averages.

The average production of cows which completed their test compared with that for the two previous years is as follows:—

Year.	Average Butter Fat per Cow, without Allowances.
	lbs.
1935–36	297·17
1936–37	300·87
1937–38	298·08

It will be seen that the average production of pure bred cows under test is approximately constant, and it is probable that, by careful management and more attention to culling in some herds, this figure for average production could be increased considerably, as is indicated in Table 1 where the percentage of cows passing the standard for each breed is shown.

TABLE 1.

Breed.	Number of Cows Tested.	Number of Cows passing Standard.	Percentage of Cows passing Standard.
A.I. Shorthorn	159	94	59·1
Guernsey	64	44	68·7
Jersey	110	39	35·6
Total	333	177	53·1

The total number of cows which completed their test and which passed the standards for production was only 53.1 per cent. compared with 63.7 per cent. for the previous year, and it will be noticed from the table that the lower percentage is due to the comparatively poor performance of one breed.

The position which stud breeders fill in the dairying industry is a most important and responsible one, as upon the comparatively few stud herds devolves the responsibility of providing pure bred dairy sires for maintaining and improving the production in commercial herds.

Six years ago the only herds tested were pure bred herds, but, during the last few years, the owners of commercial herds have been afforded the opportunity of testing their cows under the Grade Herd Recording Scheme. The result has been that many of these farmers, by improving their feeding methods and by persistently culling non-producers, have raised the production of their herds to a level which is now comparable with the average of pure bred herds. Such commercial farmers

are faced with the very serious problem of obtaining dairy sires from stud breeders, which at least will not reduce their average production. It, therefore, is incumbent upon stud breeders to adopt those methods which are proving successful in commercial herds for improving the productions of their own cows, these factors being the well-known ones of ample feeding, fodder conservation, and the eradication of low-testing cows. This latter factor is one that is more costly for stud breeders, as such cows may have cost considerable sums to procure, but, unless it is recognised that the only reason for purchasing the stud animal is that it may prove a high producer and, in addition, have the capacity for passing on that characteristic, then there is no justification for maintaining a stud of pure bred animals.

The writer believes that the average low productions of the Jersey breed during the past year was mainly owing to lack of attention and poor management on the part of some owners and not to any "falling off" in the quality of the stock.

TABLE 2.

Class.	A.I. Shorthorn.		Guernsey.		Jersey.		All Breeds.	
	No. of Cows.	Average Butter Fat.	No. of Cows.	Average Butter Fat.	No. of Cows.	Average Butter Fat.	No. of Cows.	Average Butter Fat.
Mature	31	354·25	21	371·13	36	303·24	88	337·41
Senior 4 years ...	16	302·77	4	347·53	8	273·39	28	300·77
Junior 4 „ ...	14	300·25	4	328·30	11	286·64	29	298·96
Senior 3 „ ...	13	297·88	9	373·28	8	321·03	30	326·71
Junior 3 „ ...	24	313·21	5	324·45	11	287·46	40	307·54
Senior 2 „ ...	8	253·81	4	321·96	12	210·92	24	243·72
Junior 2 „ ...	53	264·61	17	262·64	24	251·52	94	260·91

Table 2 shows the production of the cows in each class for the three breeds under test, and it will be noticed that it is mainly in the older classes that the failures occurred in the Jersey breed, which is an indication that the average low production was not due to the cows themselves, as these same animals in many instances produced considerably more during the previous one or two lactation periods as younger animals.

The trophy for the Champion Herd Sire, which is awarded each year to the bull whose leading six daughters have produced the greatest quantity of butter fat, was won by the imported Guernsey bull, "Homestead Ace," owned by Mr. A. W. Padbury. The leading six daughters of this bull averaged 498.98 lbs. butter fat with age allowances. These daughters included one junior 2-year-old, two senior 3-year-olds, and three mature cows. This bull has proved probably the most prepotent sire which has headed any stud of this breed in Western Australia.

During the year a new junior 2-year-old State record for all breeds was created by Messrs. D. Bevan & Sons' Australian Illawarra Shorthorn cow, "Glanavon Golden Girl," with a production of 421.13 lbs. butter fat, thus breaking the previous record held by the cow "Leylands' Melba," also owned by Messrs. D. Bevan & Sons, with a production of 418.43 lbs. butter fat.

The Jersey Herd Society's trophy for the highest producing Jersey cow, with allowance for age, was won by Messrs. Robinson Bros.' cow, "Travalgan Lady Mint 4th," with 607.10 lbs. butter fat. The actual production of this cow was 527.91 lbs. butter fat at 3 years 4 months of age.

TABLE III.

COWS WHICH COMPLETED TEST DURING THE 12 MONTHS ENDED 30TH JUNE, 1938.

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Calving.	No. of Days in Test.	Weight of Milk last day of Test.	Weight of Milk for period.	Average Test.	Weight of Butter-fat for period.	Owner.	Sire.
						lb.	lb.	%	lb.		
COWS UNDER 2½ YEARS—STANDARD 230 LBS. BUTTER-FAT.											
Glanavon Golden Girl	A.I.S.	....	29-8-34	20-10-36	273	36	11,558	3·60	421·13	D. Bevan & Sons ...	Blacklands Jean's Supreme (1871)
Wooroloo Poppy II.	do.	....	4-5-35	2-7-37	273	27	8,796	4·21	370·43	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Walgett Handsome Girl V.	Jersey	59902	7-4-35	14-6-37	273	13	7,126	5·12	365·07	C. J. Cunningham ...	Sabina Vale Betty's Beau (10018)
Radyr Park Dorothy IV. ...	do.	....	5-10-35	24 8-37	273	22	7,221	5·02	362·05	L. Temple	Greenmount Graceful Lad (7292)
Denmark Dawn II.	Guernsey....	5439	21-3 35	5-7-37	273	13	6,159	5·72	355·14	Denmark Research Station	Koojan Golden Prosper (2283)
Greenmount Marinita	Jersey	....	29-4-35	20-9-37	273	24	6,590	5·35	352·41	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9224)
Wooroloo Dell	A.I.S.	18628	18-10-34	7-2-37	273	26	9,142	3·78	346·30	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Greenmount Gentle Lady	Jersey	....	8-8-35	23-7-37	273	15	6,135	5·58	342·50	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9224)
Tipperary Maggie IV.	A.I.S.	18330	15-9-35	13-9-37	273	26	8,103	4·21	340·88	W. G. Burges	Blacklands Monarch's Commander (1877)
Tipperary Lady May II.	do.	18328	8-10-35	29-9-37	273	27	8,226	4·09	336·58	W. G. Burges	Blacklands Monarch's Commander (1877)
Claremont Star 14th	do.	....	18-5-35	10-9-37	273	18	7,719	4·35	335·48	Claremont Hospital for Insane	Tipperary Virginia's Re-echo (970)
Greenmount Golden Wonder	Jersey	....	28-3-35	26-7-37	273	14·5	6,089	5·41	329·20	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9224)
Glanavon Pink Pearl II.	A.I.S.	....	3-9 34	19-10-36	273	23	8,229	4·00	326·27	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Walgett Beau's Ruby	Jersey	59900	11-11-34	30-4-37	273	13	5,850	5·56	325·56	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Koojan Ace's Jewel II.	Guernsey	5661	4-3-35	28-4-37	273	13·5	6,551	4·92	322·52	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)
Koojan Ace's Daphne	do.	5657	13 8-34	9-10-36	273	22	6,405	5·03	322·39	A. W. Padbury	Koojan Ace (2270)
Claremont Treasure 11th	A.I.S.	....	3-5-35	19-9-37	273	22·5	7,973	3·94	315·28	Claremont Hospital for Insane	Claremont Herdsman (968)
Tipperary Sally	do.	18338	23-4-35	8-5-37	273	19	7,452	4·18	311·14	W. G. Burges	Blacklands Monarch's Commander (1877)
Brookfields Lady Lysle ...	Guernsey ...	5326	27-7-35	26-8-37	273	16	6,010	5·16	310·17	P. G. Hampshire & Son	Koojan Ace's Majestic (2735)
Tipperary Beauty III.	A.I.S.	18315	8-4-35	2-8-37	273	19	7,287	4·22	307·62	W. G. Burges	Blacklands Monarch's Commander (1877)
Wooroloo Fairy II.	do.	18631	3-12 34	26-2-37	273	21	7,068	4·35	307·45	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Wooroloo Moss Rose IV. .	do. ...	. ..	22-4-35	5-10-37	273	16	6,783	4·52	306·62	Wooroloo Sanatorium Farm	Triumph of Pine Creek (2515)
Claremont Plum IV.	do.	....	24-6-35	28 9-37	273	18	7,539	4·06	306·03	Claremont Hospital for Insane	Claremont Herdsman (968)
Wooroloo Joy II.	do. ...	....	3-8 35	24-8-37	273	19·5	6,854	4·43	303·58	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Wooroloo Lady Betty	do.	18634	3-8-34	21-10-36	273	21	6,993	4·33	303·44	Wooroloo Sanatorium Farm	Parkview Guardian (2557)

Claremont Poppy 6th	do.	....	26-5-34	3-10-36	273	24·5	7,569	3·94	298·00	Claremont Hospital for Insane	Tipperary Daphne's Boy (449)
Tipperary Dove IV.	do.	18323	18-7-35	29-8-37	273	23	6,729	4·37	294·37	W. G. Burges	Blacklands Monarch's Commander (1877)
Claremont Pansy IV.	do.	15069	18-12-34	20-5-37	273	12·5	6,833	4·29	293·73	Claremont Hospital for Insane	Tipperary Virginia's Re-echo (970)
Wooroloo Dove III.	do.	....	4-8-35	26-8-37	273	19	6,507	4·41	286·66	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Brookfields Primrose	Guernsey....	5331	24-2-35	27-5-37	273	13·5	5,351	5·34	285·79	P. G. Hampshire & Son	Koojan Ace's Majestic (2735)
Yanget Melba	A.I.S.	....	12-5-35	2-10-37	273	17	6,636	4·29	284·55	Wooroloo Sanatorium Farm	Parkview Sunrise (1875)
Westby Carnation	do.	18514	30-5 35	20-9-37	273	21·5	7,430	3·82	284·27	Bayley Bros.	Telyarup Duke (956)
Koojan Ace's Ida	Guernsey....	5659	28-9-34	18-11-36	273	11	4,833	5·77	278·94	J. R. Giles	Homestead Ace (imp. U.S.A.) (1631)
Glanavon Tiny	A.I.S. ...	....	25-9-34	25-11-36	273	10	6,330	4·36	275·97	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Glanavon Venus	do.	....	14-10-34	5-10-36	273	18	6,774	4·10	275·78	D. Bevan & Sons	Parkview Commodore (306)
Denmark Rose Pearl 8th	Guernsey....	5450	23-3-35	23-8-37	240	12	4,830	5·76	275·13	Denmark Research Station	Koojan Golden Prosper (2283)
Westby Lupin III.	A.I.S.	18516	31-8-34	21-10-36	273	18	6,744	4·06	273·59	Bayley Bros.	Telyarup Duke (956)
Wooroloo Sunflower	do.	15348	1-8-34	24-10-36	273	18	6,174	4·42	273·44	Wooroloo Sanatorium Farm	Wooroloo Prince (2974)
Wooroloo Doll	do.	....	22-4-35	4-7-37	273	15·5	6,317	4·31	272·08	Wooroloo Sanatorium Farm	Triumph of Pine Creek (2515)
Claremont Belle 15th	do.	....	1-7-35	9-9-37	273	17	6,726	4·04	271·90	Claremont Hospital for Insane	Tipperary Virginia's Re-echo (970)
Walgett Joy Bells	Jersey	59904	19-7-35	10-4-37	273	9·5	4,919	5·52	271·83	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Muresk Sunshine	Guernsey....	6065	13-4 35	10-5 37	273	12·5	4,913	5·53	271·64	J. R. Giles	Muresk Golden Chief (2925)
Glanavon Doris II.	A.I.S.	....	30-8-34	24-9-36	273	11	6,423	4·20	269·89	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Claremont Whitby Maid 21st	do.	15980	16-9-34	30-11-36	273	25	6,735	3·98	267·88	Claremont Hospital for Insane	Claremont Herdsman (968)
The Wold Air Daisy	Jersey	59710	26-4-35	19-6-37	240	10·5	5,400	4·93	266·37	L. C. Field	Grantham Air Prince II. (10657)
Wooroloo Sunshine III.	A.I.S.	18638	3-1-35	1-3-37	273	21	6,168	4·26	262·91	Wooroloo Sanatorium Farm	Triumph of Pine Creek (2515)
Claremont Biddy 28th	do. ...	....	12-7-35	20-9-37	273	19	6,582	3·97	261·29	Claremont Hospital for Insane	Claremont Herdsman (968)
Grass Vale Lady Fowler 20th	Jersey	....	29-5-35	12-9-37	240	11	5,033	5·15	259·20	R. H. Rose	Spring Park Starbright's Sweet Duke
Claremont Poppy 7th	A.I.S.	....	12-4-35	16-6-37	273	23	6,774	3·78	256·02	Claremont Hospital for Insane	Claremont Herdsman (968)
Claremont Maggie Morrison 17th	do.	....	2-9-35	8-9-37	273	21	6,513	3·89	253·16	Claremont Hospital for Insane	Claremont Herdsman (968)
Yanget Florrie	do.	18653	18-3-35	7-6-37	273	19	6,234	4·04	251·75	A. E. Grant	Parkview Sunrise (1875)
Colmyn Brown Maggie ..	Jersey	56859	27-6-35	2-9 37	273	13	5,484	4·58	251·54	C. H. Ironmonger	Colmyn Prince Victor (10492)
Wooroloo Sunflower II.	A.I.S.	18637	3-9-34	30-12-36	273	15	5,820	4·30	250·55	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Colmyn Susan	Jersey	56862	6-4-35	20-8-37	273	13	4,839	5·17	250·45	C. H. Ironmonger	Colmyn Captain Mac (5855)
Muresk Trixie	Guernsey....	6067	29-3-35	24-8-37	273	9	4,782	5·18	247·84	Muresk Agricultural College	Muresk Golden Chief (2925)
Wooroloo Primrose	A.I.S.	18635	8-10-34	7-2-37	273	13	5,661	4·35	246·15	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Lansdowne Clarissa	Guernsey....	5678	2-9 35	1-7-37	273	13	4,509	5·48	244·73	J. R. Giles	Koojan Ace (2270)
Muresk Tess	do.	6066	15-5-35	6-9-37	273	13	4,991	4·86	242·76	P. G. Hampshire & Son	Muresk Homestead (2075)
Westby Pearl II.	A.I.S.	18518	28-2-35	19-5-37	273	16	6,198	3·88	240·64	Bayley Bros.	Telyarup Duke (956)
Brookfields Mignonette	Guernsey....	5329	18-6-35	2-8-37	273	16·5	5,008	4·80	240·25	P. G. Hampshire & Son	Koojan Lord Barclay (1031)
Denmark Rose Ophelia	do.	5448	11-7-35	15-8-37	273	12	4,956	4·83	239·44	Denmark Research Station	Koojan Golden Prosper (2383)

HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Calving.	No. of Days in Test.	Weight of Milk last day of Test.	Weight of Milk for period.	Average Test.	Weight of Butter-fat for period.	Owner.	Sire.
						lb.	lb.	%	lb.		
Radyr Park Clarionette	Jersey		9 2 36	14-9-37	273	13	4,149	5·74	238·26	L. Temple	Graceful Lad of Greenmount (7292)
Claremont Beauty 11th	A.I.S.	15947	30 6 34	25 11 36	273	14·5	5,534	4·27	236·59	Claremont Hospital for Insane	Tipperary Virginia's Re-echo (970)
Wooroloo Kitty III.	do.	...	9-7 35	14-8-37	273	17	5,511	4·27	235·41	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Claremont Star 13th	do.	15973	25-10-34	14 12-36	273	14	5,517	4·21	232·58	Claremont Hospital for Insane	Wooroloo Persimmon (2972)
Glanavon Sunbeam 6th	do.		8 11-34	18-3 37	273	16	5,658	4·10	232·12	D. Bevan & Sons	Glanavon Nimrod (437)
Claremont Pinafore 4th	do.	15970	23 7 34	25 10 36	273	17·5	5,383	4·22	227·12	Claremont Hospital for Insane	Claremont Herdsman (968)
Radyr Park Dorothy III.	Jersey	59125	15 11-34	11-11-36	273	11	4,218	5·36	226·04	L. Temple	Graceful Lad of Greenmount (7292)
Radyr Park Melody	do.	59126	26-1 35	9-11 36	273	10	3,840	5·88	225·99	L. Temple	Graceful Lad of Greenmount (7292)
Glanavon Pansy II.	A.I.S.		6-11 34	26 11-36	273	16	5,568	4·03	224·66	D. Bevan & Sons	Parkview Commodore (306)
Crantock White Stockings	Jersey	56955	9 4-36	6-6 37	273	11·5	4,018	5·54	221·92	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Moorlands Judy	do.		4-5 35	27 6-37	273	10	4,395	4·97	218·36	Estate late P. Rose	Preston Prospector (11024)
Wooroloo Ruby II.	A.I.S.	18636	22 10 34	21 4-37	273	12	5,091	4·24	215·99	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Muresk Janet	Guernsey	6055	20 5 35	18 8 37	273	7	4,026	5·29	213·04	Muresk Agricultural College	Muresk Homestead (2075)
Moorlands Janet	Jersey		25 3-35	1-9 37	240	11	4,320	4·90	211·20	Estate late P. Rose	Preston Prospector (11024)
Muresk Pearl	Guernsey	6062	11-7 34	11-10 36	240	16	4,403	4·72	208·02	Muresk Agricultural College	Muresk Homestead (2075)
Wooroloo Daphne	A.I.S.	18627	6 2-35	25-2 37	210	17·5	4,575	4·54	207·90	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Rutherwood Rosalyn	Guernsey	6264	18 8 35	15 7-37	273	8·5	3,851	5·31	204·70	Misses E. & I. Rutherford	Denmark Rosa's Prosper (2639)
Denmark Irish Rosette	do.	5442	27 3 35	22 4 37	273	12	3,996	5·06	202·35	Misses E. & I. Rutherford	Denmark Damon (2519)
Moorlands Josephine	Jersey		24 5 35	2-8 37	273	10·5	4,037	5·01	202·19	Estate late P. Rose	Preston Prospector (11024)
Crantock Cream Duchess II	do.		2 8 35	14 10 37	240	9	3,840	5·26	201·93	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Moorlands Juanita	do.		12 4 35	6-7-37	210	12·5	4,320	4·60	198·84	Estate late P. Rose	Preston Prospector (11024)
Wattle Creek Violet	A.I.S.	18479	23 11 34	2 12 36	273	14	5,202	3·80	197·67	E. T. Thatcher	Glanavon Prospero (2118)
Glanavon Esmeralda II.	do.		11 3 35	22 4 37	240	20	5,070	3·80	192·36	D. Bevan & Sons	Parkview Commodore (306)
The Wold Air Queen	Jersey	59711	23 5-35	27-6 37	210	12	4,245	4·53	192·15	L. C. Field	Grantham Air Prince II. (10657)
Claremont Flora II.	A.I.S.	15962	30 8 34	9 10 36	273	11	4,578	4·17	190·84	Claremont Hospital for Insane	Tipperary Virginia's Re-echo (970)
Moorlands Joeelyn	Jersey		3 8 35	20-6 37	273	8	3,729	5·05	188·34	Estate late P. Rose	Melrose Liberty (7973)
Claremont Blossom 16th	A.I.S.	15952	26 8 34	7 11 36	273	10	4,103	4·35	178·75	Claremont Hospital for Insane	Claremont Herdsman (968)
Crantock Golden Duchess	Jersey		8 8 35	27 8 37	240	7	3,150	5·64	177·69	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Glanavon Rosalie	A.I.S.		12 2 35	3-5 37	240	19	5,115	3·41	174·70	D. Bevan & Sons	Parkview Commodore (307)
Colwyn Maley	Jersey	56861	29 6-35	4-8 37	210	8	3,345	4·71	157·44	C. H. Ironmonger	Colwyn Captain Mac (5855)
Claremont Blossom 17th	A.I.S.	15953	27 9 34	30 11 36	210	7	3,030	4·47	134·34	Claremont Hospital for Insane	Tipperary Virginia's Re-echo (970)
Glanavon Ada	do.		10 10 34	8 2 37	150	20	3,450	3·78	130·44	D. Bevan & Sons	Villiers of Darbalara (2386)
Yanget Treasure	do.	18661	12 5 35	5-8 37	273	4	3,620	3·60	130·17	A. E. Grant	Sunrise of Parkview (1875)
Claremont Star 15th	do.		25 5-35	12 9-37	90	27	2,813	4·17	117·40	Claremont Hospital for Insane	Claremont Herdsman (968)
Glanavon Addie II.	do.		1 2 35	19 3 37	120	21	3,000	3·60	107·91	D. Bevan & Sons	Tipperary Lu Lu's Victor (2865)
Juadine Peerless Lily 9th	Jersey		27 9-35	27-12-37	30	24	720	4·70	33·84	Miss L. Hancock	Juadine Sunshine (8212)

COWS 2½ YEARS AND UNDER 3 YEARS—STANDARD 250 Lbs. BUTTER-FAT.

Greenmount Titania	Jersey	.	12-3-35	8-10 37	273	22	6,906	5·80	400·16	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9224)
Claremont Cherry 8th	A.I.S.	15954	11-9-34	17-6-37	273	35	9,765	3·73	363·96	Claremont Hospital for Insane	Claremont Herdsman (968)
Brookfields Lady Hope	Guernsey	5825	14-9-34	8-9-37	273	15	6,925	5·23	362·23	P. G. Hampshire & Son	Koojan Lord Barklay (1031)
Brookfields Morden Lady	do.	5330	10-10-34	26-9-37	273	17	5,934	5·68	336·94	P. G. Hampshire & Son	Koojan Lord Barklay (1031)
Brookfields Lady Lynette	do.	5327	21-7-34	23-5-37	273	17	6,186	5·05	311·51	P. G. Hampshire & Son	Koojan Lord Barklay (1031)
Tipperary Amy	A.I.S.	18313	2-4-34	14-12-36	273	20	7,440	4·10	305·09	W. G. Burges	Blacklands Monarch's Commander (1877)
Muresk Moss Rose	Guernsey	6060	17-8-34	4-4-37	273	11·5	5,210	5·53	277·18	Muresk Agricultural College	Minnamurra Plaintiff (1318)
Westby Polly III.	A.I.S.	18519	4-10-34	18-9-37	273	18·5	6,701	3·98	266·57	Bayley Bros.	Telyarup Duke (956)
Leylands Radium	do.	17176	15-3-34	10-11-36	273	17	6,156	4·10	254·32	Prowse Bros.	Widgee Waa Record (848)
The Wold Merry Daisy	Jersey	5552S	14-8-34	10-7-37	210	11·5	4,560	5·55	253·09	L. C. Field	Merry King of Greenmount (4306)
Glanavon Carmen	A.I.S.	.	21-4-34	19-2-37	273	21	5,883	4·00	235·14	D. Bevan and Sons	Glanavon Valiant (438)
Moorlands Italy	Jersey	.	20-7-34	19-5-37	240	9·5	4,733	4·94	233·93	Estate late P. Rose	Melrose Liberty (7973)
Grass Vale Molly's Nora	do.	57561	9-8-34	8-8-37	273	10	4,512	5·11	230·22	R. H. Rose	Banyule Silvermine's Twylish (7600)
Moorlands Iliad	do.	.	12-6-34	23-5-37	240	11	4,125	5·55	228·84	Estate late P. Rose	Melrose Liberty (7973)
Moorlands Isla	do.	.	25-7-34	16-7-37	273	4·5	4,559	5·02	228·83	Estate late P. Rose	Preston Prospector (11024)
Colwyn Pearl	do.	52319	25-11-34	18-6-37	273	7	4,011	5·62	224·78	C. H. Ironmonger	Colwyn Captain Mac (5855)
Glanavon Irene	A.I.S.	.	22-8-34	10-3-37	273	14	5,232	4·27	223·28	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Tirano Mabel	do.	18341	12-11-34	28-9-37	273	13	4,644	4·24	196·76	A. Della	Bryn-y-mor Charmer (266)
Yanget Royal Lady II.	do.	.	13-11-34	30-8-37	273	14·5	4,919	3·77	185·35	A. E. Grant	Tipperary Topsy's Monarch (2875)
Moorlands Imena	Jersey	.	1-12-34	6-6-37	180	12	3,030	5·30	166·65	Estate late P. Rose	Melrose Clarion (6931)
Moorlands Idela	do.	.	14-10-34	3-6-37	240	5	3,585	4·65	165·84	Estate late P. Rose	Preston Prospector (11024)
Sabina Vale Princess	do.	59372	9-9-34	9-6-37	240	5	2,490	6·15	153·15	Sabina Vale Stud Farm	Banyule Ettric (9200)
Crantock Golden Cream	do.	52397	27-6-34	2-3-37	210	11	2,490	6·08	151·40	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Sabina Vale Orchid	do.	.	3-9-34	19-6-37	210	6·5	1,815	5·19	94·17	Sabina Vale Stud Farm	Banyule Ettric (9200)
Selsey Wyandotte III.	do.	55215	14-8-34	23-5-37	60	17	1,050	7·86	82·56	Robinson Bros.	Brampton Great Boy (imp.) (9137)

COWS 3 YEARS AND UNDER 3½ YEARS—STANDARD 270 Lb. BUTTER-FAT.

Leylands Melba	A.I.S.	17170	1-9-33	21-11-36	273	46	12,858	4·44	570·46	D. Bevan & Sons	Widgee Waa Record (848)
Travalgan Lady Mint IV.	Jersey	55607	11-4-34	3-8-37	273	26	8,263	6·38	527·91	Robinson Bros.	Banyule Altitude (5793)
Newstead Lovely 20th	A.I.S.	17585	19-2-34	28-2-37	273	25	11,535	4·01	462·13	W. G. Burges	Renown of Newstead (3077)
Koojan Ace's Daphne	Guernsey	5657	13-8-34	3-10-37	273	25	7,725	5·45	420·80	A. W. Padbury	Koojan Ace (2270)
Claremont Clara 7th	A.I.S.	15957	1-4-34	4-9-37	273	34	10,227	4·01	410·40	Claremont Hospital for Insane	Tipperary Virginia's Re-echo (970)
Tipperary Beauty II.	A.I.S.	18314	8-4-34	20-6-37	273	24	9,447	4·30	406·28	W. G. Burges	Blacklands Monarch's Commander (1877)
Wooroloo Dove II.	do.	15323	6-5-34	27-9-37	273	28	9,444	4·29	405·44	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Wooroloo Flash	do.	15329	1-3-34	8-6-37	273	19	8,367	4·32	361·86	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Greenmount Sweet Lass	Jersey	44204	14-7-33	3-1-37	273	16·5	6,440	5·51	354·98	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9224)
Selsey Attraction	do.	55203	16-7-34	5-9-37	273	18	5,694	6·14	350·09	Robinson Bros.	Brampton Great Boy (imp.) (9137)
Greenmount Little Dot	do.	57570	26-4-34	15-9-37	273	16	6,522	5·23	340·89	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9224)
Lansdowne Joyce	Guernsey	4361	17-3-34	24-4-37	273	19	6,897	4·92	339·74	J. R. Giles	Koojan Ace's Advocate (2272)
Koojan Ace's Algra	do.	4331	22-9-33	17-11-36	273	15	5,340	6·12	326·55	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)

HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Calving.	No. of Days in Test.	Weight of Milk last day of Test.	Weight of Milk for period.	Average Test.	Weight of Butter-fat for period.	Owner.	Sire.
						lb.	lb.	%	lb.		
Greenmount Golden Dewdrop	Jersey	57569	7-8-34	26-9-37	273	11·5	5,165	6·16	318·12	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9224)
Lansdowne Diana	Guernsey	4358	2-5-34	24-7-37	273	16	6,438	4·89	314·86	J. R. Giles	Koojan Ace's Advocate (2272)
Wooroloo Joy	A.I.S.	15333	10-4-34	11-8-37	273	11·5	6,332	4·94	313·32	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Wooroloo Milkmaid V.	do.	15339	2-1-34	18-3-37	273	17	7,971	3·92	312·53	E. T. Thatcher	Parkview Guardian (2557)
Westby Polly II.	do.	15142	1-12-33	7-5-37	273	19	8,787	3·55	311·66	Bayley Bros.	Telyarup Duke (956)
Glanavon Dahlia II.	do.	....	10-5-34	26-6-37	273	19	7,197	4·31	310·63	D. Bevan & Sons	Glanavon Nimrod (437)
Claremont Maggie 6th	do.	9933	8-9-33	20-11-36	273	11·5	7,940	3·89	309·03	Claremont Hospital for Insane	Claremont Herdsman (968)
Tipperary Dove	do.	18320	21-4-34	3-6-37	273	21	7,158	4·25	304·13	W. G. Burges	Blacklands Monarch's Commander (1877)
Leylands Champagne's Lovely	do.	12249	5-6-34	22-7-37	273	18	7,772	3·81	296·26	A. E. Grant	Thornleigh Champagne (930)
Tirano Betty	do.	....	7-10-33	15-1-37	273	23	7,044	4·12	291·56	A. Della	Bryn-y-mor Charmer (266)
Wooroloo Gold	do.	18632	31-1-34	7-4-37	273	11	6,165	4·11	286·60	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Yanget Duchess II.	do.	15410	10-5-34	16-9-37	273	12	7,559	3·74	282·62	A. E. Grant	Parkview Sunrise (1875)
Wooroloo Eva II.	do.	15327	27-8-33	25-12-36	273	21	6,783	4·00	271·20	Wooroloo Sanatorium Farm	Wooroloo Prince (2974)
Yanget Della II.	do.	15409	3-5-34	11-9-37	273	10·5	6,827	3·88	264·77	A. E. Grant	Parkview Sunrise (1875)
Moorlands Jone	Jersey	....	27-3-34	14-8-37	240	18	5,963	4·40	262·61	Estate late P. Rose	Melrose Liberty (7973)
Lemon Grove Dora 8th	A.I.S.	17141	12-12-33	18-4-37	273	16	6,423	4·07	260·61	Prowse Bros.	Dan of Greyleigh (97)
Leylands Tiny	do.	17181	24-2-34	15-4-37	273	18	6,639	3·85	255·65	Prowse Bros.	Parkview Commodore (306)
Yanget Royal Lady	do.	15417	21-9-33	26-10-36	240	29·5	7,883	3·23	254·70	A. E. Grant	Glanavon Defender (959)
Colmyn Violet	Jersey	52322	6-10-34	8-10-37	273	12·5	4,898	5·16	253·04	C. H. Ironmonger	Colmyn Prince Victor (10492)
Glanavon Sunbeam IV.	A.I.S.	16492	28-9-33	27-2-37	273	11	5,703	4·17	237·85	D. Bevan and Sons	Tipperary Peter Pan (962)
Denmark Dawn	Guernsey	4117	6-3-34	21-6-37	150	26	4,065	5·42	220·32	Denmark Research Station	Koojan Golden Proper (2283)
Moorlands Ina	Jersey	....	18-5-34	27-6-37	273	8	4,599	4·42	214·41	Estate late P. Rose	Preston Prospector (11024)
Crantock Spotted Socks	do.	....	20-9-33	24-12-36	273	8	3,474	5·71	198·30	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Claremont Treasure 8th	A.I.S.	9948	21-8-33	7-12-36	180	8·5	4,980	3·72	185·52	Claremont Hospital for Insane	Tipperary Daphne's Boy (449)
Sabina Vale Lady	Jersey	59371	6-5-34	28-7-37	273	12·5	3,998	4·30	171·89	Sabina Vale Stud Farm	Banyule Ettric (9200)
The Wold Northwood Pride	Jersey	50863	5-5-34	24-5-37	180	10·5	3,615	4·70	169·79	L. C. Field	Lonswood Lord Grey (7291)
Tipperary Victress	A.I.S.	14790	8-7-34	9-8-37	150	25·5	4,860	3·33	161·94	A. E. Grant	Parkview Rosy's Monarch (1681)
Moorlands Ira	Jersey	....	1-7-34	4-8-37	120	13·5	2,775	4·89	135·75	Estate late P. Rose	Melrose Liberty (7973)
Wooroloo Rose III.	A.I.S.	15344	27-11-33	4-2-37	120	23	2,962	4·58	135·64	Wooroloo Sanatorium Farm	Triumph of Pine Creek (2515)
Sabina Vale Silvermine V.	Jersey	....	13-5-34	21-5-37	90	10	1,095	5·19	56·85	Sabina Vale Stud Farm	Banyule Ettric (9200)

COWS 3½ YEARS AND UNDER 4 YEARS—STANDARD 290 LB. BUTTER-FAT.

Koojan Ace's Jewel	Guernsey	4333	19-2-33	12-2-37	273	25	8,515	5·42	461·60	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)
Koojan Golden Butterfly	do.	4339	18-4-33	20-1-37	273	28	8,094	5·63	456·06	A. W. Padbury	Koojan Ace (2270)
Koojan Lady Olive	do.	4340	11-2-33	9-2-37	273	25	8,895	4·99	443·55	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)

Walgett Joy	Jersey	51064	8-7-33	3-6-37	273	15	7,335	5·80	425·65	C. J. Cunningham	Mokine Centenary (7595)
Walgett Water Lily	do.	51066	28-8-33	17-4-37	273	20	8,595	4·73	406·84	C. J. Cunningham	Mokine Centenary (7595)
Lansdowne Cream Lass	Guernsey	4354	7-10-33	19-9-37	273	22	6,596	5·87	387·57	J. R. Giles	Koojan Ace's Advocate (2272)
Muresk Damsel	do.	4720	2-11-33	9-5-37	273	18	7,839	4·94	387·45	Muresk Agricultural College	Muresk Homestead (2075)
Lemon Grove Fussy 6th	A.I.S.	17144	10-5-33	2-4-37	273	24	8,847	4·03	357·91	Prowse Bros.	Alue Bank Lady's Gift (760)
Radyr Park Laddies Princess	Jersey	54869	1-8-33	17-6-37	273	14	5,749	5·30	340·82	L. Temple	Greenmount Graceful Lad (7292)
Wooroloo Kitty II.	A.I.S.	15334	23-8-33	19-6-37	273	15	8,265	4·11	339·78	Wooroloo Sanatorium Farm	Triumph of Pine Creek (2515)
Illawah Lex III.	do.	11797	15-2-33	26-1-37	273	24	9,282	3·63	336·56	D. Bevan and Sons	Illawah Veteran's Hope (822)
Greyleigh Cinderella 28th	do.	16705	4-7-33	10-6-37	273	19	7,962	4·15	330·28	Prowse Bros.	Quenton of Greyleigh (1472)
Lansdowne Bonnie Blossom II.	Guernsey	4351	6-8-33	30-5-37	273	14	6,762	4·86	328·94	J. R. Giles	Koojan Ace's Advocate (2272)
Grass Vale Twylish Eve	Jersey		17-10-33	1-7-37	273	10·5	6,197	5·04	312·39	R. H. Rose	Banyule Silvermine's Twylish (7600)
Glanavon Sunbeam III.	A.I.S.	10929	16-10-32	29-9-36	273	9	6,897	4·50	309·13	D. Bevan and Sons	Glanavon Nimrod (437)
Lansdowne Dorothy	Guernsey	4359	27-7-33	24-6-37	273	15	6,480	4·75	308·00	J. R. Giles	Koojan Ace's Advocate (2272)
Yanget Royal Lady	A.I.S.	15417	21-9-33	20-7-37	273	19·5	8,422	3·63	305·65	A. E. Grant	Glanavon Defender (959)
Denmark Opal	Guernsey	4122	19-9-33	12-9-37	273	15	5,325	5·72	304·45	Denmark Research Station	Koojan Golden Prosper (2283)
Wooroloo Matilda	A.I.S.	15336	2-3-33	4-11-36	273	17	6,651	4·56	303·33	Wooroloo Sanatorium Farm	Tipperary Persimmon (471)
Grass Vale Golden Cream 9th	Jersey		16-8-33	11-8-37	273	11	5,291	5·70	301·78	R. H. Rose	Banyule Silvermine's Twylish (7600)
Glanavon Sylvia	A.I.S.	10930	11-5-33	19-4-37	273	23	7,299	4·12	300·96	D. Bevan and Sons	Glanavon Nimrod (437)
Lemon Grove Buttercup 25th	do.	17136	25-7-33	21-5-37	273	18·5	7,288	4·10	298·97	Prowse Bros.	Alne Bank Lady's Gift (760)
Lemon Grove Gladys 10th	do.	17147	14-8-33	26-5-37	273	21·5	6,995	4·10	286·87	Prowse Bros.	Dan of Greyleigh (97)
Denmark Prosper's Della	Guernsey	4125	19-12-33	12-9-37	273	11	6,078	4·65	282·52	G. Trevor Hill	Koojan Golden Prosper (2283)
Lemon Grove Pride 8th	A.I.S.	17150	20-7-33	16-3-37	273	7	6,831	4·00	273·76	Prowse Bros.	Alne Bank Lady's Gift (760)
Grass Vale Noramine	Jersey	48537	17-11-33	1-9-37	273	10·5	4,982	5·35	267·32	R. H. Rose	Banyule Silvermine's Twylish (7600)
Colmyn Vera	do.	47680	29-9-33	1-8-37	273	9·5	4,264	5·01	263·88	C. H. Ironmonger	Rye Duke of Glen Iris (1994)
Grass Vale Golden Cream 10th	do.	48535	7-10-33	28-8-37	240	12	5,061	4·93	249·56	R. H. Rose	Banyule Silvermine's Twylish (7600)
Glanavon Addie	A.I.S.	16486	25-9-33	14-5-37	273	13	6,189	3·92	242·64	D. Bevan & Sons	Villiers of Darbalara (2386)
Glanavon Daphne	do.	10922	7-8-33	13-2-37	150	25	4,650	4·02	187·20	D. Bevan & Sons	Villiers of Darbalara (2386)
Lemon Grove Gracie 11th	do.	17148	10-8-33	21-4-37	30	24	720	4·30	30·78	Prowse Bros.	Greyleigh Archer (571)

COWS 4 YEARS AND UNDER 4½ YEARS STANDARD 310 LBS. BUTTER-FAT.

Leylands Topsy	A.I.S.	17182	18-4-33	14-9-37	273	30	11,670	3·74	436·77	D. Bevan & Sons	Parkview Commodore (306)
Koojan Ace's Algra	Guernsey	4331	22-9-33	29-9-37	273	21·5	6,380	6·09	388·34	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)
Walgett Handsome Girl II.	Jersey	51062	12-11-32	27-4-37	273	14	6,942	5·31	368·84	C. J. Cunningham	Mokine Centenary (7595)
Westby Lupin II.	A.I.S.	15139	6-9-33	10-9-37	273	24	9,389	3·89	365·47	Bayley Bros.	Telyarup Duke (956)
Westby Ulery	do.	15143	15-6-33	20-8-37	273	12·5	10,358	3·52	364·81	Bayley Bros.	Telyarup Duke (956)
Glanavon Dell	do.	8507	2-5-32	17-10-36	273	12	8,676	4·20	362·56	D. Bevan & Sons	Villiers of Darbalara (2386)
Denmark Golden Dawn	Guernsey	4118	9-1-33	17-5-37	273	11	5,823	6·06	352·79	Denmark Research Station	Koojan Golden Prosper (2283)
Muresk Olive	do.	4730	27-4-33	2-10-37	273	14·5	6,509	5·37	349·57	Muresk Agricultural College	Triumph of Wollongbar (513)
Wooroloo Duchess II.	A.I.S.	15324	15-8-32	18-11-36	240	18	8,610	4·05	348·72	E. T. Thatcher	Triumph of Pine Creek (2515)
Radyr Park Dorothy II.	Jersey	45845	24-7-32	9-11-36	273	12	5,616	5·75	333·25	L. Temple	Graceful Lad of Greenmount (7292)
Sabina Vale Blossom	do.	50536	28-11-32	25-3-37	273	13·5	6,186	5·26	325·38	Sabina Vale Stud Farm	Glen Iris Matilda's Lord (9491)
Blacklands Fortune 7th	A.I.S.	9316	11-7-32	23-11-36	273	18	7,464	4·19	313·10	W. G. Burges	Orama of Blacklands (1905)
Westby Pearl	do.	15140	19-2-33	2-4-37	273	14·5	7,773	3·87	300·91	Bayley Bros.	Telyarup Duke (956)

HERD TESTING *continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Calving.	No. of Days in Test.	Weight of Milk last day of Test.	Weight of Milk for period.	Average Test.	Weight of Butter-fat for period.	Owner.	Sire.
						lb.	lb.	%	lb.		
Glanavon Vida II.	A.I.S.	16495	25-5-33	28-8-37	273	23	7,359	4·09	300·82	E. T. Thatcher	Glanavon Nimrod (437)
Grass Vale Lady Fowler 17th	Jersey	48536	6-5-33	6-7-37	273	10·5	5,965	5·01	300·44	R. H. Rose	Banyule Silvermine's Twylish (7600)
The Wold Starbright Grey II.	do.	46430	17-4-33	25-7-37	210	18·5	7,200	4·17	299·94	L. C. Field	Lonswood Lord Grey (7291)
Greenmount Bonetienne's Twinklette	do.	44202	6-8-33	7-10-37	273	11	5,163	5·76	298·62	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9224)
Glanavon Doris	A.I.S.	10923	1-8-32	5-12-36	240	14	6,480	4·37	283·02	D. Bevan & Sons	Villiers of Darbalara (2386)
The Wold Daisy Grey II.	Jersey	46428	28-3-33	5-6-37	240	13	5,588	5·02	280·71	L. C. Field	Lonswood Lord Grey (7291)
Blacklands Ettie 9th	A.I.S.	9298	24-9-32	25-2-37	273	22	6,846	4·06	278·14	D. Bevan & Sons	Parkview Limelight (370)
Moorlands Havana	Jersey		16-5-33	21-6-37	273	7·5	4,433	5·86	259·59	Estate late P. Rose	Melrose Clarion (6931)
Sabina Vale Silvermine III.	do.	50540	25-5-33	28-8-37	273	6	4,173	6·17	257·51	Sabina Vale Stud Farm	Glen Iris Matilda's Lord (9491)
Blacklands Sadie 5th	A.I.S.	9391	26-9-32	9-2-37	240	25	6,510	3·79	246·72	D. Bevan & Sons	Blacklands Major (369)
Denmark Prosper's Mona	Guernsey	4126	2-2-33	29-5-37	273	5	5,245	4·41	232·52	Denmark Research Station	Koojan Golden Prosper (2283)
Moorlands Hecla	Jersey	58546	25-6-33	11-7-37	273	8·5	4,061	5·59	227·09	Estate late P. Rose	Melrose Clarion (6931)
Moorlands Happy	do.	54219	30-4-33	22-6-37	210	12·5	3,960	5·09	201·66	Estate late P. Rose	Melrose Liberty (7973)
Yanget Pendant II.	A.I.S.	15415	29-6-33	9-7-37	180	21·5	5,400	3·71	200·37	A. E. Grant	Yanget Lucky Boy (978)
Fairfield Victory's Actress	do.	10721	25-9-32	11-2-37	210	19	5,640	3·49	197·16	D. Bevan & Sons	Daphne's Victory of Hillview (1652)
Blacklands Thelma 7th	do.	9393	3-12-32	9-2-37	240	11	5,340	3·65	194·97	D. Bevan & Sons	Parkview Limelight (370)
Muresk Beauty	Guernsey	4716	21-4-33	22-8-37	60	23	1,665	5·07	84·54	P. G. Hampshire & Son	Minnamurra Plaintiff (1318)
Juadine Sparkle 9th	Jersey	44522	9-9-33	20-11-37	60	20·5	1,380	3·56	49·14	Miss L. Hancock	Juadine Sunshine (8212)
Denmark Pride	Guernsey	4124	16-2-33	9-6-37	30	20·5	615	5·05	31·05	Denmark Research Station	Koojan Golden Prosper (2283)

COWS 4½ YEARS AND UNDER 5 YEARS.—STANDARD 330 LB. BUTTER-FAT.

Tahbagong Dove 8th	A.I.S.	7511	19-12-31	6-11-36	273	29	10,482	4·22	442·44	W. G. Burges	Parkview Reward II. (260)
Greenmount Charming Queen	Jersey	40099	9-6-32	6-3-37	273	22	7,506	5·82	436·73	A. J. B. Strempel	Grantham Easter King (6510)
Koojan Bonnie Evelyn	Guernsey	3899	7-4-32	20-10-36	273	16·5	6,725	5·98	402·25	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)
Blacklands Cowslip 6th	A.I.S.	9288	4-12-32	2-8-37	273	18	8,664	4·27	369·97	D. Bevan & Sons	Emperor of Blacklands (947)
Denmark Rosebud	Guernsey	3876	14-3-32	12-10-36	273	17	6,668	5·42	361·38	Denmark Research Station	Wollongbar Macquarie (1244)
					365	17·5	8,233	5·50	452·98		
Walgett Handsome Girl III.	Jersey	51063	12-11-32	16-5-37	273	9	6,612	5·38	355·85	C. J. Cunningham	Mokine Centenary (7595)
Glanavon Sunbeam III.	A.I.S.	10929	16-10-32	8-9-37	273	14	7,572	4·45	336·76	D. Bevan & Sons	Glanavon Nimrod (437)
Blacklands Fairy 12th	do.	9302	6-5-32	11-4-37	273	13	8,199	4·00	328·01	D. Bevan & Sons	Orama of Blacklands (1905)
Sabina Vale Pansy	Jersey	55176	23-11-32	22-7-37	273	15·5	6,107	5·32	324·68	Sabina Vale Stud Farm	Glen Iris Matilda's Lord (9491)
Blacklands Buttercup 6th	A.I.S.	9282	6-11-32	15-5-37	273	16	6,888	4·65	320·03	D. Bevan & Sons	Orama of Blacklands (1905)
Muresk Lady Fair	Guernsey	4729	20-9-32	4-5-37	273	13·5	6,341	4·96	314·73	Muresk Agricultural College	Triumph of Wollongbar (513)
Numbawana Blossom	A.I.S.	17613	2-9-32	10-5-37	273	19	7,902	3·95	312·23	Prowse Bros.	Numbawana Flashlight (144)
Denmark Prosper's Rosa	Guernsey	4127	27-12-32	5-7-37	273	7	5,871	5·31	311·77	Denmark Research Station	Koojan Golden Prosper (2283)
Blacklands Daphne 6th	A.I.S.	9290	2-11-32	19-7-37	273	8·5	9,086	3·39	305·64	A. E. Grant	Fussy's Monarch of Hillview (493)
Blacklands Daphne 7th	do.	9291	18-10-32	21-4-37	273	17·5	7,846	3·58	303·36	A. E. Grant	Fussy's Monarch of Hillview (493)

Blacklands Lady Thelma 7th	A.I.S.	9342	1-11-32	31-8-37	273	19·5	6,944	4·21	292·07	A. E. Grant	Parkview Limelight (370)
Blacklands Myrtle 8th	do.	9369	3 9-32	30-4-37	273	5	6,990	4·17	292·01	A. E. Grant	Parkview Limelight (370)
Blacklands Red Queen 8th	do.	9386	16-10-32	30-7-37	273	5·5	8,357	3·38	282·98	A. E. Grant	Orama of Blacklands (1905)
Wooroloo Wing Wing III.	do.	7748	11 5-32	9-12-36	210	18	6,195	4·34	267·63	Wooroloo Sanitorium Farm	Triumph of Pine Creek (2515)
Sabina Vale Ruby's Lass	Jersey	....	5-4 32	8-12-36	273	14	4,752	5·62	267·29	Sabina Vale Stud Farm	Clarendon Eyre Ruby's Beau (7963)
Blacklands Florrie 14th	A.I.S.	9307	12 4-32	24-2-37	240	15	5,280	5·06	267·18	D. Bevan & Sons	Orama of Blacklands (1905)
Crantock Starbright's Napoleonette	Jersey	52400	27-11-32	17-8-37	273	7	5,241	5·01	262·40	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Blacklands Rosette II.	A.I.S.	9389	4 5-32	28-4-37	240	12	6,480	3·98	258·18	D. Bevan & Sons	Blacklands Major (369)
Numbawarra Silky III.	do.	17626	28-8-32	6-4-37	273	18	6,814	3·63	247·70	Prowse Bros.	Jellicoe of Fairfield (1136)
Moorlands Glide	Jersey	45237	5 8-32	16-7-37	180	15	4,875	4·69	223·71	Estate late P. Rose	Melrose Clarion (6931)
Blacklands Poppy 5th	A.I.S.	9372	13-10-32	29-8-37	180	20	5,760	3·70	213·12	D. Bevan & Sons	Blacklands Major (369)
Sabina Vale Silvermine II.	Jersey	55177	29 9 32	28-4-37	273	10	4,170	4·64	193·56	Sabina Vale Stud Farm	Banyule Ettrie (9200)
Koojan Pretty Polly	Guernsey	4341	19-9-32	12-2-37	120	30	3,750	4·49	168·54	J. R. Giles	Homestead Ace (imp. U.S.A.) (1631)
Moorlands Guitar	Jersey	49634	17-7-32	1-5 37	150	8	2,370	5·40	127·89	Estate late P. Rose	Melrose Liberty (7973)
Mokine Sapphire II.	do.	49584	20 10-32	10-10-37	90	21·5	2,295	5·09	117·00	Miss L. Hancock	Juardine Sunshine (8212)
Colmyn Eileen	Jersey		8-10-32	2-9-37	60	39	2,340	3·60	84·24	C. H. Ironmonger	Rye Duke of Glen Iris (1994)
Mokine Heroine 7th	do.	49583	22-11 32	4-10 37	60	28	1,680	5·00	84·00	Miss L. Hancock	Juadine Sunshine (8212)

COWS 5 YEARS AND OVER—STANDARD 350Lb. BUTTER-FAT.

Koojan Bo-peep	Guernsey	3542	26 2-31	2-4-37	273	32·5	10,089	5·59	562·03	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)
Koojan Ace's Mignonette	do.	3898	23-4-32	29-7 37	365	29	13,015	5·72	744·02	A. W. Padbury	
					273	27·5	9,023	5·93	534·69	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)
Westby Lupin	A.I.S.	15138	28-3-32	1-8-37	273	24·5	13909.	3·71	515·45	Bayley Bros.	Telyarup Duke (956)
Nancy 9th of Raleigh	do.	17519	30-4 27	7 9 37	273	32	10,436	4·87	508·50	D. Bevan & Sons	Union Jack of Raleigh (2375)
Newry Lady Freda	Guernsey	2719	13-9-28	12-5-37	273	20·5	9,272	5·41	501·86	P. G. Hampshire & Son	Koojan Mac (596)
Grass Vale Lily's Pride	Jersey	28228	10-2-29	24-4 37	273	14·5	9,284	5·29	490·96	C. J. Cunningham	Starbright's Sweet Duke of Glen Iris (3710)
Karawarra Plum III.	A.I.S.	1261	27-4 28	27-8-37	273	39	12.837	3·44	476·01	W. G. Burges	Sailor of Karrawarra (Vol. 8)
Wooroloo Jean	do.	5221	15 7-30	2-8-37	273	27	11,181	4·14	462·57	Wooroloo Sanatorium Farm	Triumph of Pine Creek (2515)
Blacklands Beauty 10th	do.	9279	2-4 32	26 6-37	273	27	10,686	4·30	460·24	W. G. Burges	Fussy's Monarch of Hillview (493)
Koojan Bonnie Evelyn	Guernsey	3899	7 4-32	25-9-37	273	17	7,746	5·89	456·45	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)
Wingeewah Melba	A.I.S.	6732	22-4-31	15-10 36	273	36	11,718	3·84	449·65	A. Della	Regent of The Hill (3038)
Radyr Park Dorothy	Jersey	45844	27 7 31	12-9-37	273	16	8,793	5·08	446·92	L. Temple	Melrose Clarion (6931)
Beauna Vista Fairy 5th	A.I.S.	1322	8-12-29	9-10-36	273	27·5	105.38	4·15	437·44	Prowse Bros.	Spearfelt of Alne Bank (1029)
Greenmount Starbright Marinora	Jersey	34841	31-5-30	24 3-37	273	19	7,769	5·53	429·39	A. J. B. Strempel	Werribee Starbright's King (2602)
New Park Sally 9th	A.I.S.	1873	30-4-29	8-5-37	240	21	11,835	3·63	429·12	W. G. Burges	Ruler of Greyleigh (1855)
Wyuna Lady Dawn	Guernsey	2472	12-11-29	14-5-37	273	12	8,796	4·83	425·48	Denmark Research Station	Nundorah Prosper (664)
Wingeewah Kate III.	A.I.S.	1535	20-3-29	3 11 36	273	37	10,791	3·94	424·11	A. Della	Daphne's Defiance of Hillview (Vol. 8)
Walgett Handsome Girl	Jersey	42402	1-12-31	19 4-37	273	14	7,377	5·65	416·58	C. J. Cunningham	Burekup Campanile's Duke (7287)
Koojan Morden Lady IV.	Guernsey	1901	23 9 26	20-9-37	273	19	7,617	5·45	415·11	J. R. Giles	Robin of Nundorah (417)
Banyule Silvermine 66th	Jersey	28847	10 9-29	2-4 37	273	22	8,189	5·04	412·37	Sabina Vale Stud Farm	Milkmaid's Chief of Banyule (1412)
The Wold Starbright Daisy	do.	31179	8-7-30	31 5 37	240	16	7,282	5·62	408·98	L. C. Field	Grantham Starbright's King (5796)
Walgett Fortune	do.	42401	10-11-30	20 4-37	273	15	8.100	5·03	407·19	C. J. Cunningham	The Valley Twylish Fox (5623)
The Pines Bell	A.I.S.	4079	6-9 30	27 8-37	273	26	8,603	4·58	394·51	E. T. Thatcher	Democrat of Alne Bank (1625)
Wingeewah Silver III.	do.	1547	4-10-28	2 5 37	273	19	9,462	4·15	392·48	A. Della	Karawarra Werri (2759)

HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Calving.	No. of Days in Test.	Weight of Milk last day of Test.	Weight of Milk for period.	Average Test.	Weight of Butter-fat for period.	Owner.	Sire.
						lb.	lb.	%	lb.		
The Wold Daisy Northwood	Jersey	25064	11-7-28	19-5-37	273	11	6,798	5·61	381·24	L. C. Field	Grass Vale Northwood King (5620)
Swanlea Lovely 7th	A.I.S.	4284	12 2 31	23 4-37	273	12	10,491	3·58	376·07	A. E. Grant	Headlight of Parkview (1406)
Koojan Dame	Guernsey	1252	18-6-24	30-10-36	273	25	9,885	3·78	373·10	Denmark Research Station	Robin of Nundorah (417)
Karridale Girlie	do.	3820	24 9-30	28-9-37	273	16	7,855	4·74	372·72	P. G. Hampshire & Son	Minnamurra Rose Chief (1016)
Springmead Josephine	Jersey	42003	10-6-31	10-8-37	273	15	5,940	6·09	361·71	Robinson Bros.	Bellefaire Blonde's Corsican (7040)
Radyr Park Laddie's Estrellita	Jersey	45846	16 7 32	1-8-37	273	9	6,456	5·61	361·61	L. Temple	Graceful Lad of Greenmount (7292)
Claremont Laura III.	A.I.S.	8328	26-4-31	9-4-37	273	17	9,441	3·83	361·57	Claremont Hospital for Insane	Claremont Elector (446)
Muresk Rose	Guernsey....	2156	9 5-28	7-8-37	240	17	7,515	4·76	357·82	Muresk Agricultural College	Triumph of Wollongbar
Beauna Vista Tiny 18th	A.I.S.	4221	24-6-30	18-6-37	273	23·5	9,461	3·73	353·22	Prowse Bros.	Spearfelt of Alne Bank (1029)
Kudardup Pansy	Guernsey....	2927	16 1-31	30 4-37	273	12	5,996	5·87	352·22	J. R. Giles	Newry Golden Prince (977)
Moorlands Dot	Jersey	31236	16-5-29	22 6-37	273	16	6,813	5·12	349·07	L. Temple	Melrose Romeo (5861)
Claremont Maggie Morrison 9th	A.I.S.	8329	12-11-30	12-11-36	273	11	9,768	3·56	347·71	Claremont Hospital for Insane	Claremont Elector (446)
Greenmount Marinette	Jersey	34840	24-5-31	19 9-37	273	19	6,972	4·95	346·26	A. J. B. Strempel	Grantham Starbright's King (5796)
Grantham Lady Fowler V.	do.	28231	17 5-29	24-6-37	273	13	6,249	5·53	345·82	L. Temple	Grantham Starbright's King (5796)
Sabina Vale Countess	do.	55175	27-4-32	9-8-37	273	12·5	5,858	5·84	342·34	Sabina Vale Stud Farm	Bellefaire Seaborn Successor (6824)
Denmark Prosper's Dinah	Guernsey....	3272	7-12-31	15-6 37	273	6·5	6,214	5·52	341·93	Denmark Research Station	Koojan Golden Prosper (2283)
Denmark Prosper's Lady	do.	3273	6-12-31	9-8-37	273	12	5,916	5·77	341·41	Denmark Research Station	Koojan Golden Prosper (2283)
Clarendon Eyre Betty	Jersey	39244	28-4-28	3-6-37	273	21·5	8,855	3·82	338·28	Sabina Vale Stud Farm	Clarendon Eyre Eminent's Achievement (4154)
Denmark Rosa	Guernsey....	1429	15-12-25	26-8 37	273	10·5	6,662	5·03	335·27	Misses E. and I. Rutherford	Rose Chief of Wollongbar (130)
Denmark Rosa III.	do.	2523	5-4-29	8 11-36	273	19·5	6,913	4·82	333·55	Denmark Research Station	Wollongbar Reformer (538)
Grangelea Buttercup	Jersey	26388	21 3 27	28-7 37	273	16	6,648	4·99	331·81	Sabina Vale Stud Farm	Grangelea Daisy's V.C. (5079)
Berrington Soprano II.	do.	28851	5 10-29	16 8-37	273	18	6,916	4·79	331·10	Sabina Vale Stud Farm	Banvale Superstrain (4529)
Radyr Park Dorothy	do.	45844	26 7-31	6-10 36	273	11	6,693	4·84	325·79	L. Temple	Melrose Clarion (6931)
Denmark Rose Dame II.	Guernsey	3280	18 7-31	23 7-37	273	15	6,735	4·79	322·78	G. Trevor Hill	Wollongbar Reformer (538)
Wingeewah Winnie 7th	A.I.S.	4395	20-3-30	27-7-37	273	8·5	9,244	3·49	322·82	A. E. Grant	Daphne's Defiance of Hillview (Vol. 8)
Glanavon Mignon	do.	5109	22 7 31	23 7-37	273	14	7,872	4·09	321·71	E. T. Thatcher	Villiers of Darbalara (2386)
Yanget Pansy II.	do.	8337	10 8-31	4 5-37	273	22	7,476	4·25	318·01	Prowse Bros.	Yanget Pet's Re-echo (452)
The Wold Northwood Grey	Jersey	42214	15 5 32	4 6 37	240	12	6,158	5·16	317·90	L. C. Field	Lonswood Lord Grey (7291)
Glanavon Gold	A.I.S.	10925	25-6 32	1 8 37	273	15	7,800	4·06	317·25	D. Bevan & Sons	Villiers of Darbalara (2386)
Tirano Charming Dinah	do.	....	28-6-32	8-10-37	273	25	8,325	3·75	312·56	A. Della	Bryn-y-mor Charmer (266)
Blacklands Miss Tottie IV.	do.	9365	12-4-32	25 9-37	273	18	7,569	4·01	303·73	A. E. Grant	Orama of Blacklands (1905)
Glanavon Greta	do.	5188	14-7-31	1-1-37	273	23	7,359	4·09	300·78	D. Bevan & Sons	Villiers of Darbalara (2386)
Hillview Fussy 344th	do.	4496	3-9-30	13-11-36	273	28·5	8,456	3·52	297·96	A. E. Grant	Limelight of Hillview (954)
Denmark Golden Marie	Guernsey	3873	26-4-32	15-8-37	273	13	5,319	5·55	295·35	Denmark Research Station	Koojan Golden Prosper (2283)
Blacklands Modesty III.	A.I.S.	9367	20-5-32	25-8-37	273	21	8,253	3·57	294·87	A. E. Grant	Emperor of Blacklands (947)
The Wold Starbright Grey	Jersey	42215	9-5-32	16 5-37	273	8	5,814	5·04	292·83	L. C. Field	Lonswood Lord Grey (7291)

Denmark Rose Dame	Guernsey....	1794	19-8-27	19-7-37	240	4	6,615	4·26	281·58	Denmark Research Station	Rose Chief of Wollongbar (130)
Denmark Annabel	do.	3264	17-6-31	14-7-37	273	10	4,943	5·68	280·85	Denmark Research Station	Wollongbar Reformer (538)
Tabbagong Beauty 19th	A.I.S.	7502	20-12-31	6 4-37	273	7	7.236	3·88	280·58	A. E. Grant	Parkview Reward II. (260)
Grass Vale Lady Fowler 16th ...	Jersey	44183	2-9-32	5-9-37	273	13	5,244	5·34	280·16	R. H. Rose	Banyule Silvermine's Twylish (7600)
Swanlea Radium 8th	A.I.S.	4990	17-7-31	12-4-37	273	24	7,197	3·87	278·77	Prowse Bros.	Headlight of Parkview (1406)
Kudardup Lillie	Guernsey....	2369	28-6-29	1-7-37	240	12	5,460	4·97	271·19	J. R. Giles	Wollongbar Associate (531)
Blacklands Graceful 7th ...	A.I.S.	9318	24-7-32	4-8-37	273	9·5	7,184	3·80	268·22	A. E. Grant	Orama of Blacklands (1905)
Crantock Lady Bluebell	Jersey	34724	26-5-29	5-8-37	273	6·5	4,595	5·83	268·16	Mrs. G. H. Burnside	Crantock Starbright's Chief (5790)
Blacklands Florrie 13th ...	A.I.S.	9306	3-12-31	24-4-37	273	14·5	6,989	3·83	267·55	A. E. Grant	Orama of Blacklands (1905)
Grass Vale Daisy II.	Jersey	23654	28-8-26	9-7-37	210	12·5	5,640	4·70	265·35	L. C. Field	Carnation's Masterpiece of Garden Hill (2065)
Tirano Princess	A.I.S.	7677	22-12-30	4-10-37	210	19	6,435	4·09	263·55	A. Della	Pine Creek Banker (450)
Banyule Silvermine 59th	Jersey	29033	10-2-29	8-1-37	273	19·5	6,239	4·11	256·40	Sabina Vale Stud Farm	Banyule Superstrain (4529)
Banyule Velveteen 12th	do.	24474	11-9-27	17-5-37	273	11	5,388	4·62	248·97	Sabina Vale Stud Farm	Wotton Airman (imp.) (2716)
Sabina Vale Lotus	do.	46111	16-1-32	15-7-37	240	12·5	5,112	4·60	235·14	Sabina Vale Stud Farm	Banyule Airo (5751)
Sabina Vale Silvermine	do.	50539	29-3-32	4-5-37	273	12	4,671	4·92	230·12	Sabina Vale Stud Farm	Banyule Lord Silvair (5752)
Grass Vale Golden Cream 6th...	do.	40079	14-8-31	9-6-37	210	12·5	4,770	4·81	229·53	R. H. Rose	Campanile's Duke of Burekup (7287)
Koojan Daffodil	Guernsey....	2231	4-10-28	17-7-37	273	10·5	4,383	5·21	228·38	Misses E. and I. Rutherford	Koojan Golden Governor (595)
Salem View Queen	A.I.S.	17999	17-12-31	26-6-37	180	23	5,595	4·04	226·62	Prowse Bros.	Fairfield Marmaduke (791)
Crantock Lady Buttercup	Jersey	39439	21-5-30	21-9-36	273	10	3,934	5·71	224·79	Mrs. G. H. Burnside	Crantock Starbright's Montrose (5945)
Moorlands Bridget	do.	24920	1-6-27	10-4-37	240	11·5	4,635	4·81	222·81	Estate late P. Rose	Colonel of Melrose (4015)
Claremont Dover 7th	A.I.S.	8327	24-5-31	7-3 37	180	18	5,340	4·08	217·98	Claremont Hospital for Insane	Searchlight of Sunny Vale (2302)
Moorlands Evelyn	Jersey	34811	28-8-30	2-4-37	150	24	4,395	4·91	215·85	Estate late P. Rose	Moorlands Romeo (5861)
Moorlands Aline	do.	23683	16-7-26	25-7-37	273	10·5	5,432	3·96	215·18	Estate late P. Rose	Colonel of Melrose (4015)
Grass Vale Golden Cream 7th....	do.	44182	19-7-32	1-8-37	210	9	4,230	4·93	208·64	R. H. Rose	Banyule Silvermine's Twylish (7600)
Woodstock Lady Morden	Guernsey....	3328	27-11-30	30-9-37	150	16	4,470	4·63	206·73	J. R. Giles	Homestead Ace (imp. U.S.A.) (1631)
Denmark Rose Pearl V.	do.	3281	20-8-30	30-7-37	120	29	3,720	5·49	204·36	Denmark Research Station	Reformer of Wollongbar (538)
Moorlands Ethel	Jersey	34808	2-4-30	12-4-37	210	6	3,720	5·31	197·55	Estate late P. Rose	Melrose Raleigh (5860)
Moorlands Clara	do.	28215	18-8-28	22-6-37	210	4	4,665	4·19	195·87	Estate late P. Rose	Grafter of Melrose (3560)
Moorlands Fanny	do.	41097	7-6-31	4-5-37	210	7	3,713	5·02	186·37	Estate late P. Rose	Melrose Raleigh (5860)
Koojan Bonnie Jean	Guernsey....	1612	28-3-26	14-7-37	90	31	3,525	5·11	180·00	A. W. Padbury	Robin of Nundorah (417)
Travalgan Lady Mint	Jersey	34789	21-6-30	24-6-37	90	33	3,060	5·73	175·41	Robinson Bros.	Tessie's Masterpiece of Garden Hill (6506)
Denmark Prosper's Velvet	Guernsey....	3875	23-3-32	12-7 37	120	23·5	3,248	5·04	163·79	Denmark Research Station	Koojan Golden Prosper (2283)
Moorlands Grace	Jersey	45241	3-5-32	3-5-37	120	12	2,265	5·72	129·69	Estate late P. Rose	Melrose Sultan (6930)
Greenmount Charming Queen ..	do.	40099	9-6-32	16-3-38	30	22·5	675	4·80	32·43	A. J. B. Strempel	Grantham Easter King (6510)
Denmark Anne	Guernsey....	1164	2-3-25	4-7-37	30	19	570	4·54	25·89	Denmark Research Station	Linwood of Wollongbar (381)
Moorlands Ella	Jersey	34802	5-5-30	5-8-37	30	20·5	615	4·10	25·17	Estate late P. Rose	Melrose Romeo (5861)

THE RELATIONSHIP BETWEEN THE HYDROGEN-ION CONCENTRATION, THE FLAVOUR, AND THE KEEPING QUALITY OF BUTTER.

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During the last butter-storage season an investigation was carried out by the officers of the Dairy Branch of the Department of Agriculture, to determine whether any correlation exists between the pH values and the keeping qualities of Western Australian salted butters. This paper presents the results thus obtained, and shows that a high correlation does exist between the pH values and the keeping qualities, and further, that a knowledge of the pH value should be a good criterion by which to judge the suitability of a batch of butter for storage purposes.

The samples were graded before and after storage by official graders of the Department of Agriculture, Messrs. P. C. Cousins and R. A. Paul. The chemical investigations were carried out by the writer.

HYDROGEN-ION CONCENTRATION AND pH VALUE.

To convey to the non-technical reader the meaning of the above two terms, based as they are upon modern physico-chemical principles, is very difficult, but it is hoped that the following notes may assist in giving a general idea of their significance.

Hydrogen gas normally contains a number of electrical charges on each component atom. However, as there is an equal number of positive and negative charges on each atom, the atoms as a whole remain neutral.

If a specially prepared length of platinum wire is dipped into a solution and a stream of hydrogen gas is then made to bubble over it, some of the gas will part with some of its normal inherent electrical charges which will be taken up by the platinum, the gas then passing into solution with an electrical charge of opposite sign to that which it has given to the platinum wire. The electrically charged hydrogen atoms which thus collect in the solution are known as the hydrogen ions. It will thus be seen that the solution acquires an opposite charge to the platinum wire, that is, an electrical potential is set up. By suitable arrangements this potential may be measured in terms of volts. The process may be visualised somewhat as shown in the diagram.

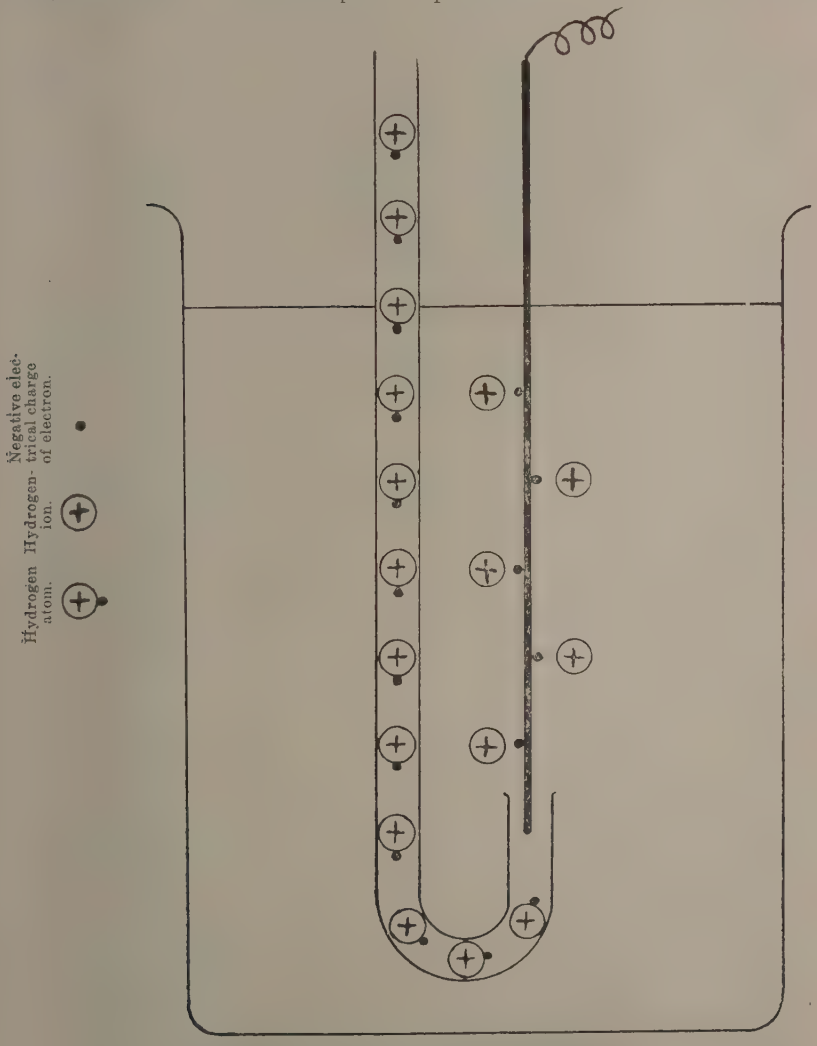
The number of hydrogen ions formed in the solution from the gas is always small, but is governed strictly by the number of such ions already present derived from other materials in the solution. Therefore, the potential developed between the platinum wire and the solution may be used to measure the number of ions already present.

The scale chosen by which to measure the hydrogen-ion concentration is known as the pH scale. It has been so chosen that a tenfold change of hydrogen-ion concentration is represented by one pH unit, one hundredfold change of hydrogen-ion concentration by two pH units, one thousandfold change of hydrogen-ion concentration by three pH units, and so on. For purposes of convenience, the pH values are made inversely proportional to the hydrogen-ion concentration, that is, as the hydrogen-ion concentration increases the pH value decreases. Therefore, an acid solution, which is one with a large concentration of hydrogen ions, has a low pH value, and an alkaline solution, which is one with a small concentration of hydrogen ions, has a high pH value.

Water itself always dissociates to some extent, that is, it breaks up into hydrogen ions and hydroxyl ions as follows:—

$$H_2O = H.OH \rightarrow H^+ + OH^-$$

It will be noted from this equation that hydrogen ions and hydroxyl ions are formed in equal quantities, and also that they carry opposite types of electricity, positive and negative. Thus the water remains electrically neutral. The hydrogen-ion concentration of water corresponds to pH value 7.



Hypothetical Picture of Hydrogen Electrode.

Acids are substances which dissociate in aqueous solution and give rise to hydrogen-ions. Consequently, when an acid is added to water the hydrogen-ion concentration increases and the pH value decreases.

Now it is a property of water and aqueous solutions that the product of the hydrogen-ion concentration and the hydroxyl-ion concentration is a constant quantity. Consequently if one concentration is increased, e.g., the hydrogen-ion concentration by the addition of an acid, the other corresponding must decrease. When an alkali is dissolved in water it gives rise to hydroxyl ions. Therefore the hydrogen-ion concentration decreases and, of course, the pH value increases.

THE INFLUENCE OF HYDROGEN-ION CONCENTRATION ON MICRO-ORGANISMAL GROWTH AND CHEMICAL REACTIONS.

The hydrogen-ion concentration of a medium almost invariably expressed as the pH value, greatly affects a very large number of biological and chemical changes. Thus the gardener who wishes to obtain a vigorous growth of yeast in his wort adjusts the reaction of the wort to be slightly acid, for it has been found that the optimum pH value of the wort for yeast growth is about pH 4. The bacteriologist, wishing to obtain a vigorous growth of bacteria, adjusts the reaction of the media he uses to an slightly alkaline about pH 7.2 to 7.4, for the bacteria generally flourish best in this condition.

Referring to bacteria actions, we may consider the souring of yeasts, moulds and bacteria in butter samples. The yeast and mould count is obtained by using a plating medium containing food materials particularly suited to the needs of the yeasts and moulds and adjusted to pH 4.7, an acidity which is not favourable for yeast and mould growth, but is not conducive to bacterial growth. The bacterial count employs another medium as used for plating which is particularly suited to the needs of bacteria; the pH is adjusted to 7.2, which represents a condition very favourable for the growth of bacteria, but not for the growth of yeasts and moulds.

As an example of the effect of hydrogen-ion concentration on a chemical change, one may cite the case of the decomposition of esters by common solutions. Esters are organic compounds which are largely responsible for the characteristic odours and flavours of fruits and flowers. In aqueous solutions esters slowly decompose into an acid and an alcohol, and this change is greatly accelerated by the presence of the hydrogen-ions derived from strong acids.

Referring back to butyric ferments that may take the cause of the oxidation of rancidity. This change was studied by Briggs (*Jr. Dairy Science* 1.0., No. 1, p. 91) who found that the preliminary lag in the process was shortened from 16.76 to 11.75 hours in a given experiment by the presence of 0.1% of lactic acid: pH values were not determined.

RESULTS OBTAINED BY PREVIOUS WORKERS.

T. Lang & Gilmour: *Jr. Irish Free State* XXXII. No. 2, p. 257, and Gilmour, p. 273.

As a result of the work quoted in this paper, it was found that "On correlating the pH values and the flavour scores—there was a decided tendency for the flavour scores to diminish as the acidity increased—*i.e.*, as the pH value decreased."

The value of a knowledge of the pH value in judging the suitability of butter for storage was also noted. "Altogether, out of the 72 boxes scored only 12 deteriorated in flavour on more than 2 months; of these 10 had pH below 6.7, one had pH 6.7, and one had a pH above 6.7. Further, out of the 72 boxes only four fell below export quality, and all these had low pH values. Remembering that but one-third of the butters had pH values below 6.7, the number with low pH that deteriorated apparently in flavour was out of all proportion to the deterioration of those with high pH. In agreement with this is the well-known fact that starter butters do not store as well as those made from fresh cream. This is possibly merely a more exaggerated case than the present one of pH difference.

"The conclusion arrived at is that when butter is to be cold stored, only lots of high pH should be selected."

In this research work the Irish workers noted little change in the pH values of the samples during storage. The following figures are taken from their report:—

Temperature of Storage.	Number of Boxes Stored.	Average Change in pH.	Maximum Change in pH.
— 2° C.	24	—0·05	—0·20
— 6° C.	24	—0·01	0·15
—12° C.	24	—0·01	—0·15
Time of Storage, 6 months			

(II.) Loftus-Hills, Scharp & Bellair, Jr. Dairy Res. V., No. 2, p. 124.

These workers found that, "With the exception of the erratic result for the one butter in the pH range 5.0-5.5 there is a distinct association between pH and change of grade."

"The boxes of butter were stored at about 12deg. F. After three months they were removed, regraded, and again sampled, the samples being examined by same methods as before."

The following table shows the results which were obtained:—

	Number of Butters Changing in Grade (points).				
pH values	1	0	—1	—2	—3 or more
5·0—5·5	1	...	...	...	...
5·5—6·0	...	2	2	3	1
6·0—6·5	...	11	11	3	1
6·5—7·0	1	4	7	1	...
7·0—7·5	1	5	8	1	...
7·5—8·0	...	2	...	...	...

As the samples were examined before and after storage it is interesting to note the change in pH values found by these workers.

"The decrease in pH on storage averaged 0.16, the values ranging from an increase of 0.03 to a decrease of 0.62. . . . . There was a distinct tendency for the pH of high pH butters to decrease more than that of the low pH butters. The change in acidity was not related to the change in grade."

THE EXPERIMENTAL PROCEDURE.

The information to be later presented in this paper was obtained from the analysis of 236 samples of butter cold-stored in Perth during the 1937-38 butter storage season. Before the storage commenced in Perth the material may have been subjected to temperatures ranging up to 60deg. or 70deg. F. for five or six days. In cold store the temperature would be maintained about 10deg. F. As the samples were taken from ordinary cold storage material, the time of storage varied. The minimum time any sample was stored was six weeks, the maximum fifteen weeks. The greatest proportion were stored between eight and eleven weeks.

THE MEASUREMENT OF THE pH VALUES OF THE BUTTER SERA.

The pH values of the samples were determined according to the methods described by the writer in Jr. Dept. Agric. W.A. Vol. XIII., Series 11, No. 3, pp. 349-354, Leaflet No. 485. The electrode vessel was not modified in any way, but in lieu of the Cambridge instrument a Tinsley potentiometer, type 3387B, with a Tinsley reflecting galvanometer, type S.L. 6 (coil resistance 74 ohms, sensitivity 126 mms/10^{-6} amp.) and universal shunt was employed.

With this method for determining the pH values, the limiting factor for the time required to perform a determination is the time employed in cleaning the platinum electrode which is used in the serum, and no matter what particular type of apparatus is employed, the cleansing of this electrode must always be carried out most carefully. The preparation of the samples for measurement may be carried out by a trained assistant whilst the chemist makes the actual potential measurements.

A constant temperature chamber was not employed, the temperature of each sample being taken immediately after the potential determination. A thermometer with a very small thin-walled bulb is required because of the small volume of serum used in each test.

The most unsatisfactory point in connection with the method of measurement is the drift in the potential reading. This drift, of course, is not peculiar to work connected with pH determinations of butter serum, being experienced with many substances, *e.g.* soils, when quinhydrone is used for one of the half-cells. It is probably caused by oxidation or reduction reactions affecting the quinone-hydroquinone balance in the quinhydrone. With a view to overcoming the difficulty, it is proposed to extend the research using the glass electrode in place of the quinhydrone.

THE CORRELATION BETWEEN THE INITIAL GRADE, THE FALL IN GRADE AND THE pH VALUES.

The following table has been drawn up to show the correlation which was found between the initial grade, the fall in grade, and the pH values:—

pH values	Grade initially.			
	93	92	91	90
	%	%	%	%
>7·2	33·3	13·9	...	3·8
7·1—7·2	20·8	2·8	6·2	...
7·0—7·1	8·3	5·5	8·6	5·8
6·9—7·0	12·5	8·3	6·2	9·6
6·8—6·9	...	8·3	11·1	11·5
6·7—6·8	...	16·6	16·0	32·7
<6·7	25·0	44·4	51·9	36·5
Average drop in grade points ...	2·0	1·3	1·0	0·02

The results presented in the table above show that there is quite a marked correlation between the initial flavour score and the pH values, the butters with the higher flavour scores being generally less acid than those with lower flavour scores. This finding agrees with the results obtained by the Irish workers.

Two points should be noted in this connection:—

(1) Is the selection of these nearly neutral, or even slightly alkaline butters due to the training of the graders to prefer this type? or

(2) Have they been chosen as the best quality material because, in neutral materials, as contrasted with acid materials, any off-flavours would not be sufficiently noticeable to command attention?

Certainly it is known to chemists working with flavouring materials that a slight degree of acidity may make very evident a flavour which would pass unnoticed in a neutral medium. In the writer's opinion it is probably the second factor which is of greatest importance.

The possibility of undesirable odours and flavours being present but masked because of the neutral condition of the material deserves investigation.

THE CORRELATION BETWEEN THE KEEPING QUALITY AND pH VALUES.

The following table has been drawn up to show the correlation between the pH values and the fall in grade of the various samples.

	pH Values.											
Fall in Grade.	<6·2	6·2–6·3	6·3–6·4	6·4–6·5	6·5–6·6	6·6–6·7	6·7–6·8	6·8–6·9	6·9–7·0	7·0–7·1	7·1–7·2	>7·2
Points.												
3 ...	50·0	12·5	...	6·6	3·7	3·6	...	4·0	...	...	7·1	7·1
2½ ...	...	...	...	...	...	...	...	...	...	...	...	14·3
2 ...	50·0	12·5	20·0	10·0	14·8	10·7	2·6	...	26·3	15·4	42·9	35·7
1½ ...	...	12·5	...	...	11·1	3·6	5·1	4·0	...	...	...	21·4
1 ...	...	25·0	20·0	33·3	18·5	39·3	41·0	20·0	31·6	30·8	21·4	21·4
½ ...	...	37·5	40·0	26·6	33·3	25·0	2·6	44·0	10·5	38·5	14·3	...
0 ...	...	...	20·0	23·3	18·5	17·9	48·7	28·0	31·6	15·4	14·3	...
Average Fall ...	2·5	1·2	0·8	0·9	0·9	0·6	0·5	0·6	0·9	0·8	1·4	1·8

Note.—Owing to the very small number of samples which had a pH value of 6.2 or lower, no great importance should be attached to the figures in the first column of the table.

The figures in the table are grouped to show the percentage of the butter samples which have the pH value at the head of the column and which deteriorated by the number of grade points shown at the left side of the table.

The results tabulated above are shown graphically on the next page. The butter is classed according to the number of grade points by which it deteriorated.

Assuming that the weight of butter in a given class will be roughly proportional to the number of samples in it, the areas of the chart appropriately shaded will be roughly proportional to the weight of butter so classified.

From the chart it is obvious that the optimum acidity for keeping quality is about pH 6.7-6.9. Judged on the results obtained with this set of samples, one would expect about 50 per cent. of the butter having a pH value in this range (6.7-6.9) to show no deterioration in quality, and not more than 5 per cent. of it to show a fall of 2 or 3 grade points.

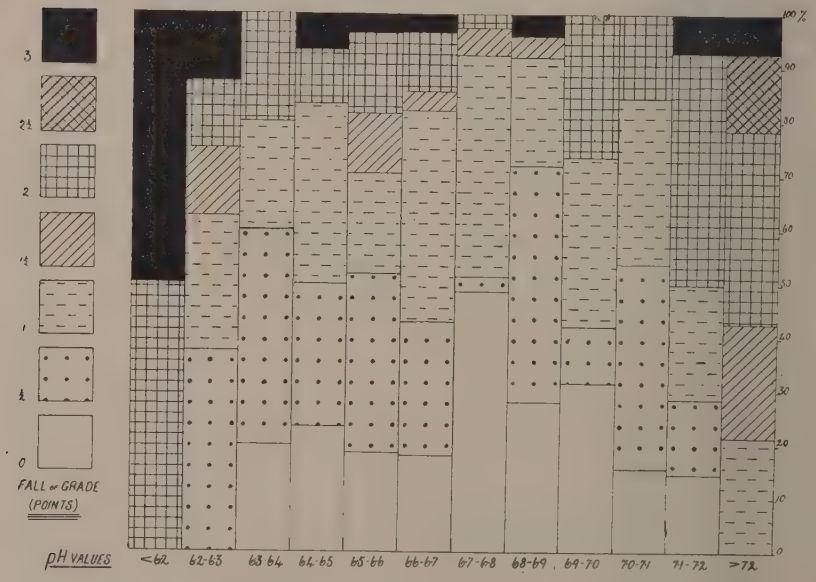
When the further possibility—that the slight acidity of a sample will probably show up any flavour defects—is taken into consideration, it is obvious that to produce high quality material which is going to maintain that quality, only the very best grade raw materials, coupled with carefully controlled manufacturing processes, are allowable.

The chart also shows that it is not desirable to store butter having a pH value greater than 7.1 or less than 6.3, for only a small percentage outside this range will maintain its initial grade.

In so far as there is on the average a greater depreciation in flavour score among the samples having pH values below 6.7 than among samples having pH values between 6.7 and 6.9, the results agree with those obtained by the previous workers for Irish and Eastern States butter.

Moreover there is the additional fact that the samples having pH values greater than 6.9, also tended to deteriorate to a greater extent than those having pH values between 6.7 and 6.9. One would suspect bacterial decomposition in this case because of the neutral to slightly alkaline nature of the material. But

GRAPH SHOWING CORRELATION BETWEEN pH VALUES AND KEEPING QUALITY.



bacterial growth would not be expected at the low temperature of storage, about 10deg. F. This is supported by figures obtained by the Irish workers, of which the following are representative:—

Organisms Counted.	Average Change. %
Yeasts	—51·3
Moulds	—83·3
Bacteria	—66·5

(Temperature of storage —12° c., time 6 months.)

It must be remembered, however, that in the case of the West Australian butter, a large proportion of the samples may have been kept at temperatures far above final storage temperature for some days before cold storage commenced. During this pre-storage period considerable bacterial growth may have taken place with consequent enzyme production, which latter would slowly attack the butter during the storage period.

In view of the information obtained, it is interesting to examine the pH values of the butter samples from various Western Australian factories. This information is shown in the following table:—

	Factories.							
pH values	901	903	910	911	912	913	914	915
>7·0	62·1	50·0	66·6	25·9	10·3	8·3	3·8	7·7
<6·3	3·4	...	...	3·4	3·4	8·3	7·7	1·9
6·7—6·9	6·9	50·0	11·1	22·2	58·6	25·0	23·1	35·0
Average pH	7·00	6·93 *	7·08 *	6·77	6·76	6·69 *	6·60	6·57

*Insufficient number of samples submitted to give the figures any great value.

The table shows that the factories numbered 901 and 911 are making a large percentage of their butter with a too high pH value for it to have good keeping quality. However, this may be a desirable condition in material for quick-sale purposes, as, generally, a high pH value is correlated with high initial grade. The same remarks probably apply also to the factories numbered 903 and 910, although the number of samples examined was too small to draw a really reliable conclusion in these cases.

FURTHER POINTS ARISING OUT OF THE WORK.

Examination of the tubes of centrifuged material before the contents are disturbed by drawing off the serum, gives an excellent indication of the amount of extraneous matter present in the butter. During the process of centrifuging, such material, having a higher specific gravity than the fat or serum, is thrown to the bottom of the centrifuge tubes, and, by examination of the tubes from beneath an idea of the relative cleanliness of the samples is obtained.

Quite a large number of the samples had an appreciable amount of sediment, the source of which is difficult to state with accuracy at present.

THE CORRELATION BETWEEN THE TITRATABLE ACIDITY OF CREAM AND THE pH VALUE OF THE BUTTER PREPARED FROM IT.

In order to utilise the information presented above, it is necessary to know the relationship between the titratable acidity of cream and the pH value of the resultant butter. To obtain this information reference should be made to the work of Wiley (Dairy Res. Inst., N.Z. Pub. 104, 1937). By interpolation from the results presented in the paper, it is seen that to obtain a final pH value of 6.7-6.9 in the butter serum, a titratable acidity of 0.10-0.12 per cent. (lactic acid) should be produced in the cream.

SUMMARY AND CONCLUSIONS.

As a result of the work reported in this paper it is concluded that:—

(1) There is a marked correlation between the initial flavour score and the pH values, the butters with the higher flavour scores being generally less acid than those with lower flavour scores.

(2) There is a marked correlation between the keeping quality in cold store and pH values. The optimum acidity for keeping quality is about pH 6.7-6.9.

(3) The electrometric method for the determination of the pH values of butter sera referred to in the paper is convenient, rapid, and well adapted to the work.

(4) The method for the separation of the butter sera referred to in the paper enables one to make simultaneous examinations of the quantity of extraneous matter in the butter samples.

ACKNOWLEDGMENT.

The work reported in this paper was made possible by a donation from the Dairy Products Marketing Board for the purchase of the Tinsley Potentiometer and subsidiary apparatus.

AGRICULTURAL PROBLEMS.

Agriculturists, pastoralists and primary producers generally, who may be having difficulties of any kind in connection with their production activities, are invited to communicate with the Agricultural Adviser of their district of the Department of Agriculture, when information and advice will be supplied free of charge.

Where identification of plant or stock diseases or insect pests is required, full details of symptoms should be forwarded and also samples of the diseased plant, animal tissue or insect where practicable. Plant tissue intended for examination by the Plant Pathologist should be wrapped in paper and not forwarded in airtight containers, and plant specimens for the Botanist should be pressed between newspaper and dried before despatch. With regard to animal tissue for microscopic examination, this should be forwarded in a solution of 10 per cent. formalin, or if of considerable bulk in a sealed kerosene tin containing a few ounces of formalin as a preservative. Living insects should be sent in suitable containers and dead specimens in methylated spirits.

The addresses and names of Advisers are as follows:—

Albany	**H. R. Powell (Fruit); B. Williams (Dairying).**
Bridgetown	**A. Flintoff (Fruit); A. M. Tindale (Dairying).**
Bunbury	**M. Cullity.**
Geraldton	**N. Davenport (Government Buildings).**
Gosnells	**R. C. Owen.**
Harvey	**R. L. Cailes (Fruit).**
Katanning	**A. S. Wild.**
Kalamunda-Roleystone	**W. H. Read, c/o. Department of Agriculture, Perth.**
Kununoppin	**W. M. Nunn.**
Manjimup	**C. M. Scott.**
Metropolitan, Gingin, Chittering ...	**S. E. Bennett, c/o. Department of Agriculture, Perth.**
Mundaring	**V. Cahill.**
Narrogin	**A. T. Gulvin.**
Vasse	**J. M. Nelson.**

PASTURE RENOVATION.

H. G. Elliott,
Agricultural Adviser, Dairy Branch.

In many countries it has been recognised for a long while that the harrowing of pastures and the mechanical renovation of certain types of pastures, more particularly Paspalum swards, are essential and a feature of efficient pasture management.

At the present time there are many makes of pasture harrows on the market, all of which are suitable for their particular purposes. It is generally recognised to-day that the autumn and winter harrowing of pastures is best carried out with a combination of the zig zag and chain types.

Autumn harrowing of pastures is a very valuable practice, which may be carried out to advantage during April and May. The principal benefit of this harrowing is to distribute animal droppings which, if not scattered, brings about a deterioration of the pasture in that rank patchy growth occurs; this is not liked and very seldom eaten by stock. If full advantage is to be taken of the fertilising ingredients in these droppings, they must be spread as uniformly as possible over the field by means of the harrows. Usually a cross-harrowing is essential in the early part of the season to obtain this uniform spread. It is not recommended to continue this harrowing late into the spring, as fouling of the grass will occur if rain does not follow soon after harrowing.

Renovation with some form of tyned or rotary renovator can be carried out successfully on subterranean clover pastures prior to germination. This renovation produces a surface mulch which, when the first rains occur, will absorb all the moisture, thereby assisting the young clover plants to withstand any drought periods which may occur prior to the general winter rains.

Renovation of Sod Type of Pastures.

It is quite frequently noticed in the sod type of grass pasture that an unfavourable condition for maximum pasture growth commences once the sward is well established, and many failures to obtain a satisfactory response to fertilisers on sod bound paspalum areas have been due to unsuitable conditions to produce results.

In old neglected paspalum pastures, very little if any clover, and practically no paspalum growth, are obtained. This condition is brought about by dead root accumulation in the upper layers of the soil, which acts as a thatch and interferes with the development of the young roots and the aeration of the soil. To overcome this, the first essential operation is to clean off any long grass growth and dry material from the field. This operation is necessary, otherwise renovating implements, more particularly the rotary type, and grass harrows will clog up, thereby not doing effective work.

The best time to renovate is in the autumn to early winter months. Two types of renovators can be used, namely, the rotary and tyned types.

The amount of renovation necessary to work an area satisfactorily depends on the age and condition of the pasture. In the case of badly sod bound paspalum, kikuyu, or couch grass pasture, two or even three workings 3 to 5 inches deep may be required. The second or last renovation should be across the previous one. Fertiliser should then be applied, and the complete area harrowed with pasture harrows to distribute animal droppings, smooth the surface, and create a soil mulch.

INFECTIOUS ARTHRITIS IN LAMBS.

A. McK. CLARK, L.V.Sc., Chief Veterinary Surgeon.

Arthritis in lambs is not uncommonly seen in this State and owing to its infectious nature appears to be slowly spreading. It is on this account that the attention of every sheep owner is drawn to the possibility of its appearance amongst his flocks, and the consequent need for added precautions during routine work of "marking."

When an outbreak of this disease occurs a considerable loss results economically from the inability to fatten those affected at the required time—if, in some cases, at all. Some develop into the "crippled" condition and do not recover.

Although arthritis affects lambs particularly, any mature sheep may become affected sex playing no definite part. One can recognise the disease in the following observations of affected sheep:—

Symptoms.

The lamb firstly shows dullness and ceases to feed. The gait becomes stilty and there is stiffness and soreness when walking. This stiffness and soreness may be confined to one limb, but eventually two or more become affected. The lameness is due to joint affection and the consequent pain in those areas results in a disinclination on the part of the lamb to flex or extend the joint, the hock, stifle, fetlock or any articulations of the limb being implicated. The normal action of the limb is affected in such a manner that the lamb becomes immobile. When the animal is forcibly driven the lameness to some extent wears off. A recumbent attitude of the lambs is particularly noticeable in cold weather and in the mornings. On closer examination no abnormalities are noticed around the joint. There are no swellings and the disease can only be detected in the abnormal walk of the lamb. The majority of affected lambs recover after a few weeks, whilst a few remain cripples for the remainder of their existence. Of those affected it is estimated that 5 per cent. remain permanently crippled. However, owing to the inability of those affected to move about normally, loss of condition ensues, this being a retarding factor in their normal growth and their readiness for market.

On post mortem examination the articular surfaces of the joint show ulcerations. The bone when boiled and cleaned shows "pittings" on the surfaces referred to.

Cause.

The cause of infectious arthritis is a specific bacillus which has a selective affinity for the joints. This germ apparently infects the soil and gains access to the bodies of the lambs through open wounds. The disease makes its appearance usually after "marking," *i.e.*, the infection gains access through the open wounds resulting from de-tailing, castration and earmarking, and in particular any wound which may have contact with the soil.

Remedy.

There are no known means of curing the disease.

Prevention.

Something can be done in connection with prevention. Great care should be taken when "marking" to prevent the infection of wounds caused by de-tailing, castration and earmarking. All instruments should be cleansed by boiling in a solution of water and carbonate of soda for 10 to 15 minutes or allowed to soak in hot antiseptic solution. The operations comprised in "marking" should be done in yards which are not in constant use. A temporary rail should be erected in

well-grassed areas if possible, and a new site selected each year. When the operations are completed the lamb should not be carelessly dropped on to the ground but placed thereon so that it can walk away without the possibility of its wounds coming in contact with the ground or soil. Antiseptics may be used. Care should be taken that the operator and attendants have clean overalls, and that their hands be kept free from dirt as much as possible. It is of the utmost importance that all wounds be kept free from contamination.

NOTICE TO FRUIT GROWERS.

Regulations gazetted under the Plant Diseases Act, 1914-1938, on the 20th May, 1938, make it compulsory to use the following bait and instructions regarding infested fruit:—

COMPULSORY FRUIT FLY FOLIAGE BAIT.

Formulae:

(1) 1 oz. Sodium fluosilicate
2½ lbs. sugar
4 gallons of water

(2) *For household use.*
Stock solution for keeping:
1 dessertspoonful Sodium fluosilicate
1 pint of water

For use:
3 tablespoonfuls stock solution
3 tablespoonfuls sugar
1 pint of water

(3) *Proprietary Mixture*:
A ready to use Sodium fluosilicate bait is obtainable under the name of "109."

The addition of any fruit juices in season will increase the attractiveness of the baits.

All mixtures should be kept agitated while in use.

Quantities.

A gallon of mixture is sufficient to treat 40 trees or 100 grape vines. For backyard trees about half a cup of bait is sufficient.

Method of Application.

The mixture should be applied to the foliage on two or more sides of the tree with a spray pump or syringe, or splashed on with a whitewash brush or perforated tin, once every six days. Apply six weeks before fruit is ripe and two weeks after fruit has been stripped.

All infested fruit must be picked from the trees and the ground daily and destroyed by boiling or steeping in a vessel containing water and kerosene for three days.

Warning.

The quantities stated in the formula given above should be rigidly adhered to, for at the strength quoted Sodium Fluosilicate, while quite effective in destroying fruit flies, is harmless to human beings.

ALL-AUSTRALIA EXPORT LAMB COMPETITIONS, 1937-1938.

The Australian Meat Board has made available the following report of last year's (1937-38) All-Australia Export Lamb competition judged by Mr. J. I. Hamilton.

Although this competition has been concluded for some time and the results have been made available to the Press, this report gives the details of the different points scored under each heading, and the judge's comments on the competition.

JUDGE'S FINAL REPORT.

CLASS I.
Lambs sired by Southdown rams.

CLASS II.
Lambs sired by other breeds of British rams.

The number of entries judged was 131 in Class I. and nine in Class II., a total of 700 carcasses. The entries were made up as follows:—

	Class I.	Class II.	Total.
South Australia	59	...	59
Tasmania	34	1	35
Victoria	17	4	21
New South Wales	10	3	13
Western Australia	9	1	10
Queensland	2	...	2
	131	9	140

In Class I. the standard of quality was a high one, 72 of the 131 pens scoring 75 per cent. or more of the possible points. Of the remainder, 40 pens scored between 70 and 74 per cent., and there were 19 below 70 per cent., including four below 60 per cent. Two of the latter were from Victoria and two from New South Wales and none of these were considered up to Class I. standard.

The Tasmanian entries included the Grand Champion and should be mentioned first. The winning entry (Messrs. N. S. and I. A. Badcock) were the only two pens in one entry to score each over 90 points, and the aggregate of 193 was a phenomenally high one. The average number of points scored by the Tasmanian entries was 78.8.

Western Australia.—High as was the Tasmanian average of points scored, it was exceeded by the Western Australian entries with 80.5. The highest number of points scored by a Western Australian entry was 94 in the case of Mr. B. D. Bothe's pen, No. 2, and five pens scored 80 or more.

Victoria.—Although a Victorian entry was successful in the Southdown Championship (and in Class II. also) the number of entries received from the State was disappointingly small and they were not up to the standard expected.

The winners (Mr. E. C. Henry's pens, Nos. 9 and 12) were two outstandingly well balanced pens, but these were a long way ahead of anything else from Victoria. The highest number of points scored was 92 (Mr. E. C. Henry's pen No. 9) and the average for the State 75.6.

South Australia.—As regards the number of entries combined with a high average, South Australia's was the most creditable performance. Entries totalled 59 (in Class I.) and the highest number of points scored was 90, with Mr. T. Ridgway's Pen No. 17 (September). The average number of points scored by

the South Australian entries was 74.9, and it was very noticeable that they were at their best in the early competitions and fell away later.

Queensland.—In point of fact Queensland has the highest average of points scored, viz. 90, but entries from that State were confined to Mr. Prentice's (Nos. 1 and 2). Mr. Prentice enjoys the distinction of having gained the highest number of points for a pen—96—with the single exception of the Grand Champion (first pen) and of demonstrating that, under certain circumstances, export lambs can be produced in Queensland as well as anywhere else in Australia or, for that matter, other countries which export lambs to the United Kingdom.

In competitions, where a high standard was set and only eight of the 131 entries (in Class I.) scored 90 points or more, it is very gratifying to find that each State contributed a pen to this distinguished list. The following is the list:—

N. S. & I. A. Badcock (No. 1), Tasmania	98
F. Prentice (No. 1), Queensland	96
N. S. & I. A. Badcock (No. 2), Tasmania	95
B. D. Bothe (No. 2), Western Australia	94
*A. J. Archie & Son (No. 36), Tasmania	94
E. C. Henry (No. 9), Victoria	92
T. Ridgway (No. 17), South Australia	90
*Memsie Pastoral Co. (No. 2), N.S.W.	90

*Only one pen entered.

Class II.—Entries in this Class were disappointing as regards numbers, totalling only nine in all, and, in fact, only two competitors submitted the required number of pens to be eligible for the prize.

The prize went to Messrs. E. and B. Hawkins, Victoria, but the Longerenong Agricultural College, Victoria, entered the pen which scored the highest number of points—82. The five leading pens (Messrs. E. and B. Hawkins (2), Agricultural High School, New South Wales, and Longerenong College) were good commercial types, but contrasted very unfavourably with the Southdown Class.

Breeding Ewes.—No definite conclusions could be drawn from the results of the competitions with regard to the suitability of breeding ewes. The contrast between the entries in Class I, and Class II. however, was so marked that it seems possible that at least in many districts the Southdown ram can be used to advantage to cross with any of the ewes available and produce a more or less improved type of export lamb. Obviously where it is possible to select ewes for type the best results should follow.

General.—The displays of the competition lambs created a great amount of interest and no doubt revealed to retailers that each State is capable of producing the ideal type of carcase. There still lingers a prejudice in the minds of a section of the trade, but displays of lambs comparable to any from other countries can be relied on to further remove this prejudice.

Visitors from the provinces were particularly impressed and it may confidently be expected that early shipments of Australian Down type lambs will be more eagerly sought for. In several instances retailers who made purchases of the competition lambs remarked on the wealth of meat to bone and on the pale and attractive appearance of the flesh which gave entire satisfaction to their customers.

It is recognised, of course, that lambs of Class II. represent the bulk of Australia's exports and that it is of the utmost importance that these should not be in any way overlooked. It is the Down type, however, which is demanded and one object which the competitions achieved was to demonstrate that this type is being developed in Australia with marked success.

The trade can safely be relied on to note the improvement in the Class II. type of lambs, but the development of the Down type is one which can profitably be advertised.

Judging was carried out on the following scale of points:—

		Points.
A.	Correct amount of fat and proportion of lean flesh to fat ...	50
B.	Back and filling over loins	25
C.	Depth and twist of meat on all four quarters	25
	Total	100

The following is a complete list of entries and points awarded:—

CLASS 1.

Competitor.	Entry No.	State.	Points. A.	B.	C.	Total.	Total, 2 pens.	Breed of Ewe.
N. S. & I. A. Badcock	1	Tas.	48	25	25	98	193	English Leicester cross
Do. do.	2	,,	45	25	25	95		
E. C. Henry	9	Vic.	45	23	24	92	181	Crossbred
Do.	12	,,	44	20	25	89		
F. Prentice	1	Qld.	48	24	24	96	180	Lincoln-Merino cross
Do.	2	,,	44	20	20	84		
B. D. Bothe	2	W.A.	48	23	23	94	179	Border Leicester-Merino cross
Do.	3	,,	45	20	20	85		
*A. J. Archie & Son	36	Tas.	44	25	25	94	....	Crossbred
T. Ridgway	17	S.A.	46	22	22	90	174	Border Leicester-Merino cross
Do.	5	,,	44	18	22	84		
† Do.	28	,,	38	18	18	74	....	do. do. do.
† Do.	27	,,	36	17	16	69	....	do. do. do.
*Memsie Pastoral Co.	2	N.S.W.	50	20	20	90	....	Romney Marsh-Merino cross
T. R. Secker	2	S.A.	46	22	20	88	173	Corriedale-Merino cross
Do.	1	,,	45	20	20	85		
W. & C. Von Bibra	12	Tas.	42	22	22	86	166	Crossbred
Do. do.	8	,,	42	20	18	80		
Cox Bros.	5	W.A.	45	20	20	85	165	Border Leicester-Merino cross
Do.	4	,,	38	22	20	80		
Reg. C. Grubb	59	Tas.	45	20	20	85	164	Romney-Corriedale
Do.	58	,,	38	20	20	78		
† Do.	46	,,	38	18	18	74	....	do.
† Do.	47	,,	38	20	16	74	....	do.
*Cowling & Hughes	4	S.A.	44	20	20	84	....	Merino
H. L. Harvey	41	Tas.	45	20	18	83	163	Crossbred
Do.	42	,,	42	20	18	80		
† Do.	40	,,	40	20	18	78	....	do.
Roseworthy College	6	S.A.	42	18	22	82	162	Border Leicester-Merino cross
Do. do.	1	,,	40	20	20	80		
† Do. do.	2	,,	38	18	20	76	....	do. do. do.
Lett's Stud	19	S.A.	42	20	20	82	162	Corriedale-Merino cross
Do.	18	,,	40	20	20	80		
† Do.	29	,,	38	18	16	72	....	do. do.
† Do.	42	,,	38	16	18	72	....	do. do.
† Do.	23	,,	36	17	18	71	....	do. do.
W. Fraser & Son	21	,,	42	20	20	82	162	Merino
Do.	16	,,	40	20	20	80		
Estate W. W. Mitchell	11	W.A.	42	20	20	82	161	Border Leicester-Merino cross
Do. do.	10	,,	43	18	18	79		
R. K. Heazlewood	9	Tas.	40	22	20	82	160	English Leicester cross
Do.	10	,,	40	20	18	78		
† Do.	55	,,	36	18	16	70	....	English Leicester-Merino cross
† Do.	56	,,	36	18	16	70	....	do. do. do.
*W. A. O'Neill	6	N.S.W.	40	20	22	82		S.D. Border Leicester-Merino (2 lambs overweight)
*T. J. B. Scott	57	Tas.	42	20	20	82	...4	Crossbred
R. B. Mills & Sons	18	Vic.	40	20	20	80	158	do.
Do. do.	8	,,	42	18	18	78		
G. & E. A. Brooks, Ltd.	13	S.A.	40	20	20	80	158	Romney Marsh-Merino Comeback
Do. do.	11	,,	40	18	20	78		
† Do. do.	15	,,	40	18	20	78	....	do. do. do.
† Do. do.	10	,,	40	17	19	76	....	do. do. do.
† Do. do.	12	,,	38	18	20	76	....	do. do. do.
† Do. do.	14	,,	40	18	18	76	....	do. do. do.
† Do. do.	3	,,	38	17	20	75	....	do. do. do.
† Do. do.	9	,,	39	16	20	75	....	do. do. do.
† Do. do.	8	,,	38	16	20	74	....	do. do. do.
† Do. do.	4	,,	38	16	19	73	....	do. do. do.
† Do. do.	7	,,	38	16	18	72	....	do. do. do.
† Do. do.	26	,,	36	17	16	69	....	do. do. do.
† Do. do.	25	,,	37	15	15	67	....	do. do. do.
† Do. do.	24	,,	35	15	15	65	....	do. do. do.

*Only one pen entered. †Additional pens.

CLASS I—*continued.*

Competitor.	Entry No.	State.	Points. A.	B.	C.	Total.	Total, 2 pens.	Breed of Ewe.
Fred Carr	7	N.S.W.	40	20	20	80	158	Crossbred
Do.	8	,,	38	20	20	78		
R. C. Thompson	6	Tas.	40	20	20	80	158	Corriedale
Do.	7	,,	40	18	20	78		
† Do.	15	,,	34	16	16	66		
E. H. Thorpe	3	S.A.	46	22	20	88	157	Merino
Do.	38	,,	35	16	18	69		
H. H. Shillabeer	49	,,	42	20	18	80	156	English Leicester-Merino (1 lamb overweight)
Do.	50	,,	40	18	18	76	....	English Leicester-Merino
† Do.	32	,,	40	18	18	76	....	English Leicester-Merino cross
† Do.	33	,,	40	18	18	76	....	do. do. do.
J. P. Hiscutt	4	Tas.	40	20	20	80	152	English Leicester cross
Do.	26	,,	38	18	16	72		
H. S. Henley	1	N.S.W.	40	18	18	76	152	Romney Marsh-Merino
Do.	4	,,	40	18	18	76		
*F. T. Edwards	11	Tas.	40	20	20	80	....	Crossbred
*Lindsay Hughes & Son	37	,,	40	20	20	80	....	do.
H. R. Heazlewood	3	,,	42	20	20	82	150	Romney cross-Romney cross Ewes
Do.	54	,,	34	18	16	68		
Wm. Cock	62	,,	40	18	18	76	150	Crossbred
Do.	61	,,	38	18	18	74		
† Do.	50	,,	32	16	16	64	....	do.
R. E. Golder	34	S.A.	39	17	16	72	149	Border Leicester-Merino
Do.	35	,,	40	19	18	77		
† Do.	51	,,	36	14	14	64	....	do. do.
*H. V. Rockliffe	27	Tas.	38	20	18	76	....	Corriedale
*H. D. Moodie	17	Vic.	38	20	18	76	....	Border Leicester-Lincoln-Merino cross
C. E. Napier	5	Tas.	40	18	18	76	....	Crossbred
Sir J. Lavington Bonython	40	S.A.	38	18	18	74	148	Border Leicester-Merino cross-bred
Do. do.	41	,,	38	18	18	74		
Do. do.	22	,,	40	17	17	74	....	do. do. do.
J. McGinty	52	Tas.	40	20	16	76	146	Crossbred-Dorset Horn
Do.	39	,,	38	16	16	70		
W. G. Burgess	1	W.A.	40	18	18	76	146	Border Leicester-Merino cross
Do.	19	,,	38	16	16	70		
F. N. Simpson	45	S.A.	36	20	18	74	146	Leicester-Merino or Romney Marsh-Merino
Do.	46	,,	38	16	18	72		
† Do.	47	,,	38	16	18	72	....	do. do. do.
† Do.	48	,,	38	16	18	72	....	do. do. do.
† Do.	52	,,	34	14	14	62	....	Romney Leicester-Merino
*G. C. Topham	8	W.A.	38	18	18	74	....	Border Leicester-Merino cross
*J. B. Stephenson	39	S.A.	38	18	18	74	....	English Leicester-Merino
*P. L. Puckridge	30	,,	40	18	16	74	....	do. do.
*W. M. McFarlane	31	,,	40	18	16	74	....	Romney Marsh-Merino
D. W. Taylor	43	,,	38	16	18	72	142	Border Leicester-Merino cross
Do.	44	,,	36	16	18	70		
† Do.	36	,,	38	16	16	70	....	English Leicester-Merino
† Do.	37	,,	36	16	16	68	....	do. do.
Estate late D. MacKinnon	27	Vic.	38	16	18	72	142	Romney Marsh-Comeback cross
Do. do.	28	,,	38	16	16	70		
*H. W. Tuck	3	,,	38	18	16	72	....	Romney-Merino cross
*D. S. Henderson	10	,,	38	18	16	72	....	1st cross Romney-Merino
*L. R. Cooper	20	S.A.	38	16	18	72	....	English Leicester-Merino cross
*T. Ridgway	54	,,	38	18	16	72	....	Border Leicester-Merino (1 lamb overweight)
A. W. Giles	24	Vic.	36	18	18	72	140	Crossbred
Do.	23	,,	34	18	16	68		
*F. L. Beveridge	60	Tas.	35	18	18	71	....	Polworth cross
A. G. Jenkins	55	S.A.	36	18	16	70	138	Merino
Do.	53	,,	36	16	16	68		
W. E. Sargood	2	Vic.	40	18	17	75	135	Romney and Border Leicester-Merino cross
Do.	1	,,	40	10	10	60		
Graeme Leishman	19	,,	42	20	20	82	134	Lincoln-Merino cross
Do.	25	,,	29	11	12	52	....	do. do.
*B. J. Stocks	5	N.S.W.	36	18	16	70	....	Border Leicester-Merino (3 lambs overweight)
Lauchlan Leishman	20	Vic.	40	18	18	76	128	Lincoln-Merino cross
Do. do.	26	,,	30	10	12	52		
*P. J. B. Osborne	9	N.S.W.	32	14	14	60	....	Romney Cross Ewe
*R. O. Williams	11	,,	30	14	12	56	....	Crossbred
*Agricultural High School	12	,,	32	12	10	54	....	Romney Marsh-Merino cross

CLASS II.

E. & B. Hawkins	4	Vic.	44	18	18	80	150	Lincoln-Merino
Do.	5	,,	40	16	14	70		
Agricultural High School	15	N.S.W.	40	18	18	76	144	Romney Marsh-Merino cross
Do. do.	14	,,	38	15	15	68		
*Longerenong Agricultural College	11	Vic.	44	20	18	82	....	1st Lincoln-Merino cross
*W. G. Burgess	9	W.A.	36	16	16	68	....	Border Leicester-Merino cross
*H. R. Redditch	13	Vic.	32	18	14	64	....	Lincoln cross
*N. McKay Burbury	18	Tas.	32	14	14	60	....	Corriedale cross
*R. O. Williams	10	N.S.W.	30	14	14	58	....	Comeback Corriedale-Merino

*Only one pen entered. †Additional pens.

SOIL EROSION.

THE CONSTRUCTION OF CONTOUR BANKS.

By L. J. H. TEAKLE (Plant Nutrition Officer) and N. DAVENPORT (Agricultural Adviser—Wheat Branch).

The incidence of soil erosion has received very considerable attention all over the world during the last five years largely as a result of the surveys conducted by the Soil Conservation Service organised in the United States of America. The spectacular dust storms experienced in that country gave point to the warnings which agriculturists have repeated for a century and a half, and governmental agencies were led to finance technical investigations which showed that a serious position had developed. As a result of over-stocking, over-cultivation, cultivation in drought-liable areas and indiscriminate forest burning and cutting, very considerable areas of country were seriously damaged, reservoirs were silting up, and a national calamity was heralded by the abandonment of many thousands of farms largely as a result of soil erosion. Authoritative statements from America show that about 100,000,000 acres of erstwhile arable land have been ruined as far as further tillage is concerned. Furthermore, it is estimated that 75 per cent. of the arable land of the United States of America is in need of treatment to maintain its fertility level which is rapidly being reduced by soil erosion. In the case of water erosion on sloping country, the method of treatment is the construction of contour banks or terraces to control water movement.

Although such careful surveys have not been conducted in Australia there is ample evidence that soil erosion has taken heavy toll of farming land throughout the continent. While it is conceded that the damage is proportionally very much less serious than in the United States of America, "a competent observer from overseas has expressed the opinion that over one-half of Australia's wheat lands needs some form of erosion control, particularly by contour banks and strip cropping."[1] The interest of farmers in Western Australia in methods of preventing and remedying soil erosion damage has been much in evidence recently and there has been a demand for the details of those simple remedial and control practices which any farmer can adopt. Much of the information has already been published elsewhere but is not readily available for the farmers of this State so that repetition in this Journal is necessary.

Where Soil Erosion Occurs.

Soil erosion occurs largely in the hilly farming districts, particularly in the jam and york gum belt where the rainfall ranges from 15 to 20 inches per annum and where cultivation and cropping is a major phase of the agriculture. It almost invariably occurs where the slope of the cleared land is steeper than 2 degrees (3½ per cent.) and is evidenced by gullies and washes. These gullies and washes are not the primary condition but in themselves are the result of water running off the slopes and accumulating in the depressions, along sheep pads, tracks, etc. Following cultivation and heavy stocking, accentuated by the depredations of the rabbit, the ground loses its sponge-like qualities and water is not absorbed readily. Consequently, a considerable proportion of the rain runs off. Obviously, this is not only a loss of valuable moisture needed in the subsoil for crop growth, but damage to the soil results from the carrying away of the rich surface layers and the cutting of gullies through paddocks.

[1] "Conserve your Soil: A simple guide to Erosion Control," published by the Bank of New South Wales.

The Control of Soil Erosion.

The control of soil erosion, whether by water or wind, primarily involves proper farm management. The actual details of the most satisfactory management will vary from district to district and will depend on the nature of the soil, slope, etc. Whatever the conditions, crop rotation must be adopted to maintain, as far as possible, the absorbent qualities of the soil. This will involve the use of a pasture period, and avoidance of excessive cultivation and cropping and overstocking. Wind breaks will be an additional factor in the control of wind erosion.

For the more direct control of water erosion on slopes the construction of contour banks is the first essential.

Contour Banks.

For countless generations terraces and hillside ditches have been used to control the rush of water on slopes. The modern development, however, dates from 1885 when Mr. Mangum, of Wake Co., North Carolina, devised a broad base terrace, or contour bank which would effectively prevent accumulated water from running down slopes, would promote water absorption, and would allow free use of all farm implements. The banks are so constructed that a paddock may be worked in any way convenient to the farmer (just as if they were not present). It is generally advisable, however, to plough and/or cultivate slopes in narrow lands, following as near as possible the contour banks, and not round and round the paddock to finish in the centre.

The first essentials in terracing a paddock are the location of the outlet, determining the slope, the spacing of the contour banks, and pegging the lines the banks are to follow. This done, contour banks may be constructed by means of a plough, drawn either by horses or a tractor, by a special power grader or other suitable implement. In our experience we have found that the most suitable farm implement is a 4 or 5 furrow disc plough with large discs which will move a large body of soil each round. A mould board plough will do the job but is inconvenient on account of lack of lever control of depth of ploughing on the front carriage. The amount of work required in the construction of the banks is generally equivalent to plowing the whole paddock.

The contour bank is a structure about 20 feet across. It consists of (1) an upper ditch, which is broad and shallow, (2) a central, broad crown the top of which is 15 to 20 inches above the level of the bottom of the upper ditch, and (3) a lower, broad ditch. Figure 61 diagrammatically represents a contour bank. The resemblance to an ordinary formed dirt road will be apparent.

Generally, the contour bank is not constructed dead level but is given a slight fall (1 in 100 or 1 in 200) to allow the removal of excess water in times of heavy rains.

These banks are permanent. All that is required in their maintenance is the ploughing or cultivating of the earth to the centre of the crown whenever it has been reduced in height so much that an overflow in the event of a rain storm is likely.

*Points to be Considered.**

In order to be sure of a permanent and satisfactory job several points must be considered in the construction of contour banks.

1. Consult your agricultural adviser to get all of the information possible before starting.

* Adapted from "Crops or Canyons," published by the Caterpillar Tractor Co., Peoria, Ill., U.S.A.

2. Examine each field carefully and decide where the outlets to take excess water are to be located.

3. Determine the slope of the land and decide upon the distance apart of the banks and the fall to be given in each part of the banks.

4. Lay out the lines for the banks accurately, using a "level" giving the correct fall. Even out sharp turns.

5. Commence formation on the top bank and complete them as you go.

6. Fill in low places where water may accumulate and damage the bank.

7. Once started, finish every terrace, finish every outlet and complete the job.

The Home-made "Level."

A suitable instrument for pegging the contour banks is a home-made "level" which any handy man can make in a couple of hours. On account of weight, Oregon pine timber is recommended. Three pieces 4in. x $1\frac{1}{4}$in. by 8 feet long and one piece 6in. x $1\frac{1}{4}$in. by 12 feet 6 inches long will be required and are built into a frame as shown in figure 1. To make the structure rigid, it is recommended that a quarter inch scarf be cut in each piece of timber at the joints and that the frame be held together by means of quarter inch bolts. If three bolts are used at each joint, a dozen quarter inch by $2\frac{1}{2}$ inch bolts with washers will be required. It is essential that the spread of the legs at the base be exactly 200 inches (16 feet 8 inches), and that the centre cross-piece be exactly parallel to a line joining the lower ends of the legs.

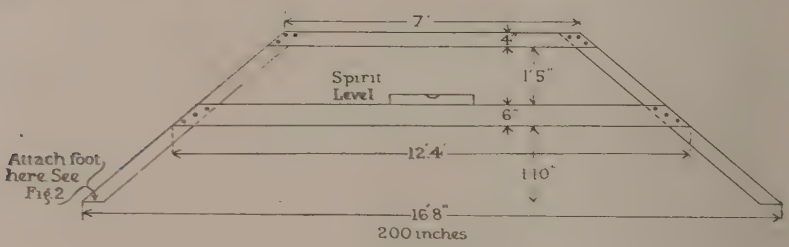


Figure 1

Details of the construction of the home-made "level." In the interests of lightness, Oregon pine is recommended but any other type of timber may be used. The overall length at the base must be exactly 200 inches and the centre cross-bar exactly parallel with the base line. The other dimensions may be varied if necessary.

An ordinary carpenter's spirit level is attached to the centre cross piece to determine when the lower ends of the two legs are exactly level.

To test the "level," set it up on a floor or smooth piece of ground so that the bubble of the spirit level is in the centre and mark the position of the lower ends of the legs. Then reverse the "level," end for end, placing the legs on the same spots. If the apparatus is in adjustment the bubble will still be in the centre. Should this be not so, the longer leg is shortened until the reading is correct.

For convenience in adjustment of the "level" for laying out contour banks of any desired slope an adjustable foot may be attached to one leg as shown in fig. 2. By using a double row of quarter inch bolt holes one inch apart, it is possible to adjust the foot in half inch intervals—that is, by intervals of one quarter per cent. slope. For the attachment of the parts of the adjustable foot, three bolts ¼in. x 1½in. and two bolts ¼in. x 3in. will be required.

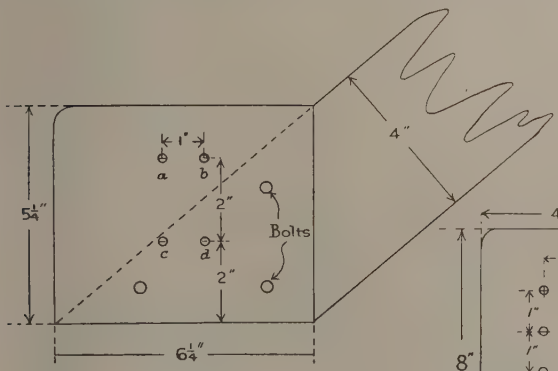


Fig. 2A

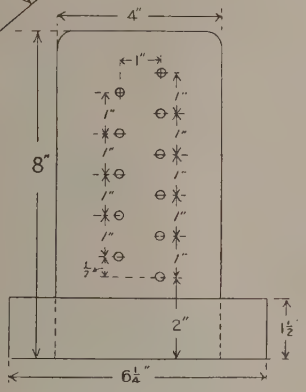


Fig. 2B

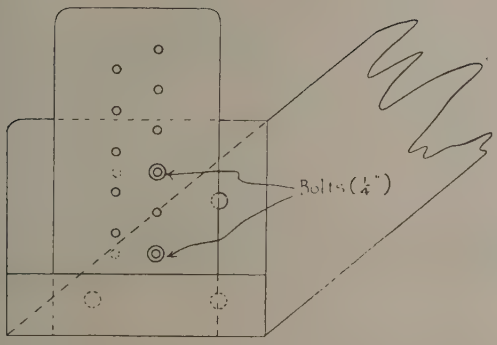


Fig 2C

FIGURE 2.

Details of the construction of the adjustable foot.

2A. The carrier for the adjustable foot. Half lap and bolt on to the end of one leg of the "level." Bore 4 quarter-inch holes, a, b, c, d, to take the bolts of the adjustable foot.

2B. The adjustable foot. The quarter-inch holes are 1 inch apart and staggered so that the adjustments may be made in half-inch intervals (*i.e.*, one quarter per cent. slope).

2C. The adjustable foot attached to the "level" by means of two quarter-inch bolts.

Decide Upon Outlets for Excess Water.

It is most important that outlets be provided for all contour banks so that excess water may be disposed of with greatest convenience and least damage. The best outlets are natural water courses or patches of absorbent scrub or pasture land, but if these are not available, broad, shallow drains may be constructed along fences or other convenient places, choosing a site with the minimum slope. These drains should be grassed, if possible, to bind the soil. Couch grass should be suitable in many districts. Rocks, brush, wire, etc., may also be used to protect the bottom of the drain from damage by the running water.

Laying out a Field for Contour Banks.

First of all, carefully examine the field for slope. This may be done by means of the "level" by placing the apparatus up and down the slope and measuring the height which the lower leg must be raised to bring the bubble into the centre. As the "level" is 200 inches long, if this eight is 16 inches, the slope must be 8 per cent. or 1 in $12\frac{1}{2}$. From the slope, the spacing of the banks may be decided using the information in table 1 as a guide. If the land is very subject to erosion, these intervals must be adhered to rigidly, or even decreased, but if the soil is very absorbent, the spacing may be increased. It is unwise to increase the intervals too much as the enlarged catchment area above each contour bank means a greater concentration of water with consequent danger of sheet erosion between the banks.

TABLE 1.

*The Spacing of Contour Banks according to Slope.**

Fall of land per 100 feet horizontal.	Vertical drop between contour banks.		Distance between centres of banks along the slope.
feet.	feet.	inches.	feet.
3	3	0	100
4	3	6	$87\frac{1}{2}$
5	4	3	85
6	5	0	83
7	5	9	82
8	6	3	78
10	6	6	65
12	7	0	58

* E. S. Clayton: Control of Soil Erosion, N.S.W. Dept. of Agriculture Bulletin.

Second, decide upon the fall to be given the contour bank. If the bank is short, say not more than 10 chains long, a uniform slope of one per cent. should meet most requirements and the adjustable foot would be lengthened by two inches. If the bank is longer, a smaller slope should be given the next 10 chains—say one-half per cent. or one inch in 200. The portions of the bank more than 20 chains from the outlet may be given a one-quarter per cent. slope or one-half inch in 200. Less than one-quarter per cent. slope is not recommended for ordinary use on account of the difficulties involved in attaining greater accuracy with the "home-made" level.

Figure 3 illustrates the variable slope contour bank.

Third, commence on the topmost bank at the outlet and peg the line of the contour bank as determined by use of the level. Guesswork is positively dangerous

and will lead to waste of the effort put into the work as inaccurately located banks are more damaging than no banks at all. With the "level" the work may be done quickly and accurately and will lay the foundation for a permanent improvement.

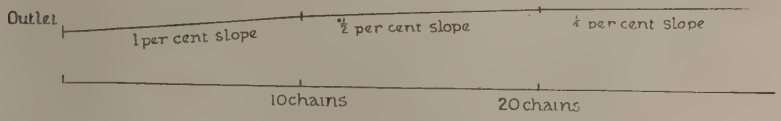


Figure 3.

The variable slope contour bank. By this means the lower end of the bank can carry off an accumulation of excess water faster than if a constant slope of, say, half per cent. is used.

Figure 4 illustrates the method of pegging the position of a contour bank. It must be remembered that the lengthened foot must always be down the slope: in working up the slope it must be in the rear; in working down the slope of the contour bank it must be in front.

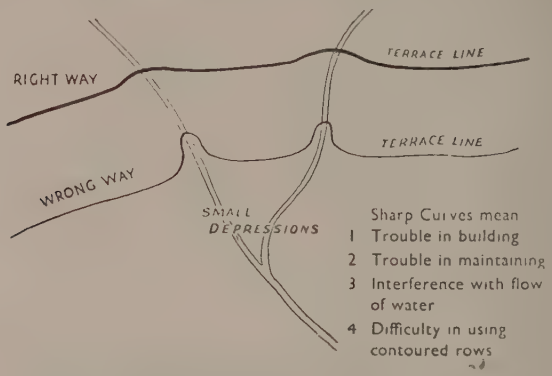
FIGURE 4.

Pegging out the position for a contour bank. A start is conveniently made from the outlet of the topmost bank. In this case the outlet is a creek with a good cover of vegetation along its banks. (Conserve your Soil: Bank of N.S.W. circular.)

Fourth, after a line is pegged it will be noticed that the stakes are somewhat irregular, due to the unevenness of the surface, and that there are sharp angles in the line where gullies or mounds occur. The small irregularities are evened out by adjusting the stakes to give smooth curves: in crossing gullies the lines are carried almost straight across and the depression filled in to the required height by means of a scoop or similar machine; mounds should be reduced likewise to allow unimpeded flow of water along the contour banks when necessary. Figure 5 illustrates the right way to carry contour banks across small depressions.

Constructing the Contour Banks.

A great variety of equipment may be used for constructing contour banks. Undoubtedly, suitably designed power graders are most economical if sufficient work to warrant the capital cost has to be done, but for the individual farmer the disc plough does a very satisfactory job. The most suitable plough has four or five



The Right and the Wrong Way to run terrace lines across small depressions.

FIGURE 5.

Avoid sharp angles in constructing contour banks across depressions. (Conserve your Soil: Bank of N.S.W. circular.)

large discs and will give sufficient width in three rounds. Two rounds will give adequate width with a ten-disc cultivating plough, but this implement is not as convenient as the 4 or 5-furrow disc plough. Horse or tractor power is equally satisfactory. The crawler type of tractor is more suitable than the wheeled type, especially if the ground is wet.

Assuming a 4 or 5 disc plough is to be used, the procedure is as follows:—

1. Set the plough to cut a depth of at least six inches, if possible.
2. Strike out along the line of stakes laying the front furrow slice on the line. On the return trip of the first round throw the first furrow slice this time on top of the first furrow slice of the previous trip. This gives a crown the height of two furrow slices.
3. Then plough two more rounds as in ordinary ploughing to give a ploughed strip about 20 feet wide.
4. Again plough a round in the centre (round 4) laying the first furrow slices one on top of the other as in the first round. This gives a crown the height of four furrow slices.
5. Plough one more round as in ordinary ploughing.
6. Using the level, determine the height of the crown above the top drain. If the height is at least 15 inches the crown is sufficiently high and only needs broadening by ploughing two more rounds (rounds 6 and 7) keeping about 18 inches from the centre in striking out the 6th round.

If the crown is less than 15 inches high it will be necessary to plough additional series of rounds into the centre until it is built up to the required height.

Diagramatic representation of the process of constructing contour banks by means of a plough is given in Figure 6. Figure 7 shows a plough in action.

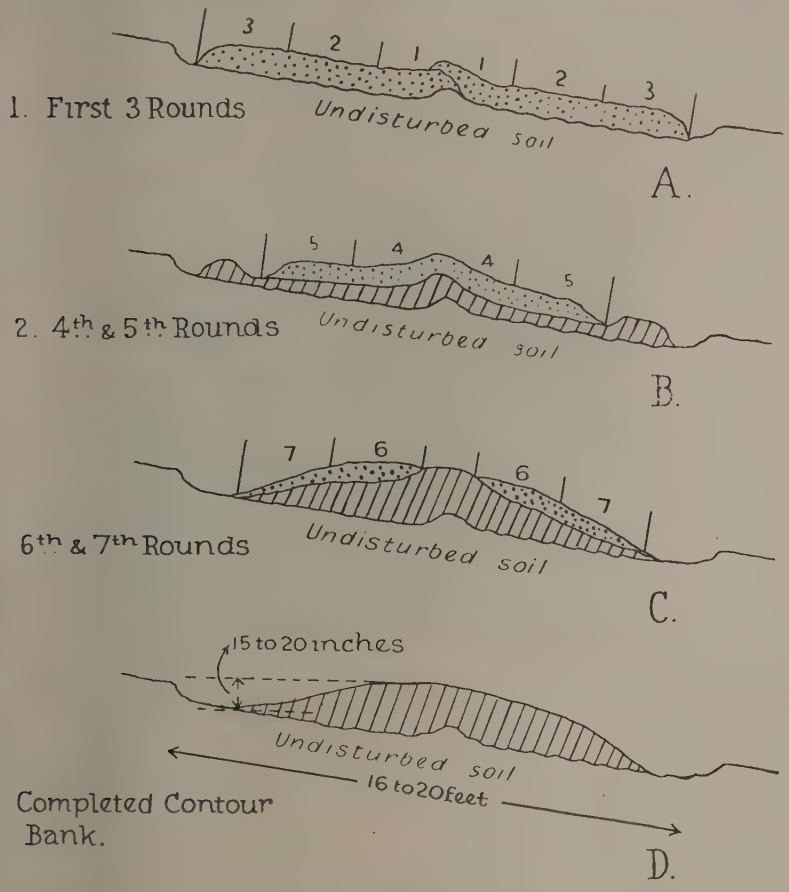


Figure 6.

Constructing broad base contour banks by means of a 4 or 5 furrow disc plough. Dotted area shows soil moved in the series of rounds being considered. Hachured area shows soil moved in the previous series of rounds.

6A. First series of 3 rounds. Note overlap in centre to form a bank.

6B. Second series of 2 rounds. The centre is again overlapped to raise the crown of the bank.

6C. Third series of 2 rounds commencing about 18 inches from the centre of the crown to broaden the crown. The second round clears and broadens the ditches.

6D. The completed contour bank. If desired a cultivator or set of harrows may be used to smooth out ridges and shoulders left by the plough.

Where the slope of the hill is greater than about 5 or 6 per cent., it is easier to move more of the soil from the upper side of the contour bank and when a 10 per cent. slope is being treated only one or two trips on the lower side will do

effective work. In such cases it is economical to construct the contour banks in the course of fallowing when all but the first trip are ploughed from the upper side. The other trips which would have been ploughed on the lower side are used for ordinary fallowing work further up the slope. On steeper slopes, too, it is necessary to give the banks a higher pitch to get the necessary height of crown.

The result should be a wide bank with a smooth, rounded top and a broad shallow drain on both the upper and lower sides. Water collecting in this drain will tend to soak in and thus add to the supplies of subsoil moisture. In the case

FIGURE 7.

Using a disc plough to build a broad base contour bank or Mangum terrace. (Conserve your Soil: Bank of N.S.W. circular.)

of heavy rainstorms the excess water is quietly moved in a broad shallow stream to the outlet and the damage resulting from water rushing over the surface and accumulating in gutters is avoided.

Testing the Contour Banks.

When the ploughing has been completed, the banks should be tested with the "level" to see that they are up to specifications. Apparent irregularities due to depressions, stony or gravelly bars, etc., must be examined so that low places may be filled in and high places cut down to allow unrestricted movement of water when necessary.

The slope along the bottom of the drain may be tested with the level as in pegging the line. To ascertain the height of the top of the bank above the drain it is suggested that one foot of the level be placed midway between these points and the other in the upper drain pointing the "level" down the slope. Measure the height to which this leg must be raised to bring the apparatus to the level, as in determining slope. Without altering the position of the upper foot, measure the drop to the top of the bank in a similar manner. In the event of the top of the bank being *higher* than the upper foot, this may be raised on a small mound of earth and the differences in height measured from this basis. The difference between these two measurements gives the height of the top of the bank above the upper drain.

Maintenance of the Contour Banks.

Contour banks require little attention but it is wise to inspect them carefully after the first heavy fall of rain to locate any weaknesses in construction and prevent damage by immediate attention. Once the banks have settled, it will be necessary to plough the earth to the centre occasionally. The height of the top of the bank above the drain will be reduced by the packing of the soil and spreading in the course of cultivation as well as by the accumulation of soil in the drain. Before this height has been so reduced that overflow is likely after heavy rains, the bank should be raised by a round or two with the plough to throw the soil to the centre.

The Value of the Contour Banks.

It is not intended to cite evidence to prove the value of the contour bank for soil conservation. Suffice it to say that it is universally recognised and experience in America has proved that they prevent erosion, conserve moisture and lead to improved crop yields. In answer to the question "Does it pay to use contour bank on slopes liable to soil erosion?" it may be stated that 6,000,000 acres of agricultural land have been treated in Texas alone. This is double the area sown to wheat in Western Australia.

Furthermore, measurements in Oklahoma have shown that, in one instance, the annual loss of soil per acre from a terraced area was 2.2 tons as compared with 64.1 tons from an unterraced area. Yields are reported to be from 20 to 40 per cent. higher on terraced areas.

Contour banks are not only of value because they prevent soil erosion but because they cause the moisture to soak into the ground. When stored in the subsoil, water is very valuable but it is a menace when moving uncontrolled over the soil surface.

Furthermore, contour banks do not interfere with the use of machinery, they may be constructed by any careful farmer with farm implements, and they are practically permanent once constructed. Failure of contour banks is always traceable to faulty work or design and not to any weakness in the system. Some farmers in New South Wales claim to construct banks at a cost of 10s. per acre. Generally, the cost would probably be greater but when combined with crop rotation and careful farm management, they represent a very sound investment wherever soil erosion is liable to occur.

ALL AUSTRALIAN PORKER AND BACONER CARCASE COMPETITIONS.

The Australian Meat Board advises that, during the present year, they will continue the competitions for export baconer and porker carcases which were successfully launched in December, 1937.

Very few entries were received last year from Western Australia, principally owing to the shortness of notice which was given prior to the closing date for entry to the competitions.

It is hoped that as many entries as possible will be submitted during the current year, and it will be noted that only three carcases are required, although five eligible pigs may be forwarded to the treatment works, from which the best selected three could be forwarded.

Should competitors desire any assistance in selecting the carcases to be forwarded, arrangements could be made by application to the Department of Agriculture for an officer to collaborate with the management of the works—through which the pigs are being shipped—in the selection of the carcases to be forwarded to London.

The following information regarding the conditions of the competitions are supplied by the Australian Meat Board:—

"The object of the competitions is to encourage the breeding of the right type of pigs for the export market and to advertise the Australian product overseas.

Conditions will be the same as last year. Entries for the next competitions must be delivered to works on or before October 15th next. Carcases will be judged in London on or about December 15th.

Each entry must be of three carcases, sired by a pure bred boar from a litter recorded by the Australian Stud Pig Breeders' Society. The three carcases may be selected from a maximum of five eligible pigs submitted.

Such particulars as age, breeding, feeds and methods of feeding and husbandry will be asked of entrants. The dam need not be pure bred but the breeding of the dam must be stated.

The weight range for entries in the porker class is from 60 lb. to 90 lb. and in the baconer class from 120 lb. to 160 lb. dressed weight and including heads in each case.

Only one entry of a particular breed or cross may be made by an individual entrant.

No entry fee will be charged but only those entries adjudged as of first grade export standard by a Commonwealth Inspector will be eligible to compete.

Competitors will be required to lodge their entry forms in the first instance with meatworks or bacon factories which they supply and to make arrangements with such works or factories for the delivery of carcases to a store in London as nominated by the Board. Payment for the pigs will be made by works in the usual way. The works will be reimbursed by the Board to the extent of ¼d. per lb. on baconer carcases as compensation for mutilation in judging.

Prizes to the value of £25 will be provided by the Board in each class. This amount will be divided up as follows—first £9, second £6, third £4, fourth £3, fifth £2, sixth £1. In addition a trophy valued at £10 10s. will be competed for in each class. First class certificates will be awarded to all entries scoring over 70 per cent. of total points and second class certificates to all scoring from 60 to 70 per cent. of the total.

Entry forms may be obtained from the office of the Australian Meat Board, 401 Collins street, Melbourne, from the Veterinary Officers of the Department of Commerce in each State, from the Department of Agriculture, Western Australia, from the Secretaries of the State Branches of the Australian Stud Pig Breeders' Society and from meatworks or bacon factories handling export pigs.—G. K. Baron-Hay.

ERRATA.

Page 325, line 3, column 10.—"Lansdowne Cream Lass," insert 393.33 lbs. in place of 387.57 lbs.

ASSOCIATIONS FOR THE IMPROVEMENT OF DAIRY HERDS IN WESTERN AUSTRALIA.

REPORT FOR YEAR ENDING 30th APRIL, 1938.

G. K. Baron-Hay, Superintendent of Dairying, and
R. A. Paul, Agricultural Adviser.

During the autumn of 1937 early rains gave promise of a good season which was sustained throughout the winter period and spring months, the general result being favourable conditions for the growth of pasture and, consequently, production of dairy products throughout the State.

The average production of those cows under test in the scheme is shown in Table 1 below and includes the productions of all cows which were under test for three months or over.

TABLE 1.

Average Production per Cow.

No. of Herds.	No. of Cows.	Milk. gals.	Test. %	Butter-fat. lbs.
393	10,033	486	4·59	223·07

This average production taken in conjunction with the average price of butter fat, approximately 15d. per lb., during the year should enable an efficient dairy farmer to conduct his business so as to yield a net profit.

While this increased yield may be due, in part, to seasonal conditions, Table 2 which shows the steady improvement each year since grade herd recording was initiated in 1933-34 indicates that testing is a great factor in effecting and then maintaining increased yields.

TABLE 2.

Average Production per Cow, 1934–1938.

Year.	No of Cows.	Milk. gals.	Test. %	Butter-fat. lbs.
1933–34	4,038	415	4·35	180·6
1934–35	4,088	456	4·56	207·8
1935–36 † ...	4,590	459	4·51	207·3
1936–37*... ...	9,115	434	4·53	196·7
1937–38† ...	10,033	486	4·59	223·1

* 9 new units. † 1 new unit.

In Table 2 above it will be noticed that 1936-37 there was an apparent reduction in yield from that of the previous year. This, however, can be explained in part by the comparatively unfavourable season, but this in itself is not a sufficient cause. The real reason is that in that year the number of cows under test was more than double, owing to the formation of nine new units, the average production of which was 181.4 lbs. butter fat. It is rather interesting to note that this average production is almost identical with the average production of the first eight units which commenced operations in 1933-34 and is a guide to the average production of the cows which are not under test throughout the dairying districts.

Generally, the average production of new units approximates from 180 to 190 lbs. butter fat, but rapidly increases after herd recording commences.

The nine units which had been under test during 1936-37 for more than one year averaged 210 lbs. butter fat per cow, thus maintaining production in spite of the unfavourable season.

PRODUCTION PER COW IN EACH UNIT.

The average production per cow in each unit is shown below in Table 3, and it will be noticed that in every instance there has been an increase in production over that for the previous season.

TABLE 3.

Average Production of Cows in each Unit.

Unit.	Herds.	Cows.	Heifers.	Milk.	Test.	1937–38. Butter-fat.	1936–37. Butter-fat.
	No.	No.	%	lbs.	%	lbs.	lbs.
A.—Donnybrook	20	433	22	5,276·60	5·20	275·18	235·79
B.—Serpentine ...	18	396	13	5,523·76	4·29	236·93	215·92
C.—Cookernup ...	23	745	21	5,257·77	4·30	230·83	195·23
D.—Harvey ...	19	545	21	4,800·00	4·58	219·69	216·08
E.—Brunswick ...	21	606	16	5,375·00	4·71	253·15	231·32
F.—Dardanup ...	22	749	15	4,512·00	4·31	192·98	180·73
G.—Capel ...	18	689	17	5,164·00	4·31	222·66	209·96
H.—Balingup ...	23	684	21	5,181·28	4·69	243·06	212·78
I.—Forest Grove...	22	505	19	4,625·00	4·58	211·82	202·43
J.—Pemberton ...	20	334	12	4,421·72	4·62	204·49	180·20
K.—Rosa Brook	25	515	12	4,744·49	4·72	224·33	195·98
L.—Vasse	23	489	31	4,802·61	4·78	229·59	...
M.—Manjimup ...	20	490	14	4,486·00	4·77	214·28	178·80
N.—Uduc	17	409	19	4,937·69	4·38	216·08	187·66
O.—Benger ...	18	522	12	5,181·40	4·58	233·25	208·14
P.—Pinjarra ...	21	533	10	4,564·93	4·63	210·01	162·66
Q.—Greenbushes ...	23	583	12	4,507·04	4·82	217·35	170·47
R.—Brookhampton	20	414	23	4,413·00	4·78	211·13	180·43
S.—Albany ...	20	392	18	4,225·00	4·39	185·46	161·95

In comparing productions of cows in different districts, it has been noticed generally that, where dairy farming is not the principal activity on a farm but is incorporated with other forms of agriculture and, in particular, beef-raising and sheep production, there is a tendency for the average yields to be depreciated. This is not necessarily the case as is exemplified by the high average production of 275 lbs. butter fat per cow in the Donnybrook district, but in this instance dairy farming may be regarded as the principal activity during nine months of the year, whilst orcharding, particularly in the packing period, precludes dairy farming during the dry months. With sheep-raising, however, adequate provision does not exist at present, particularly as regards fences, and, where dairy cows and sheep are run on the same farm, unless cows can have access to the pasture first and then be followed up by sheep, low yields seem to be the result.

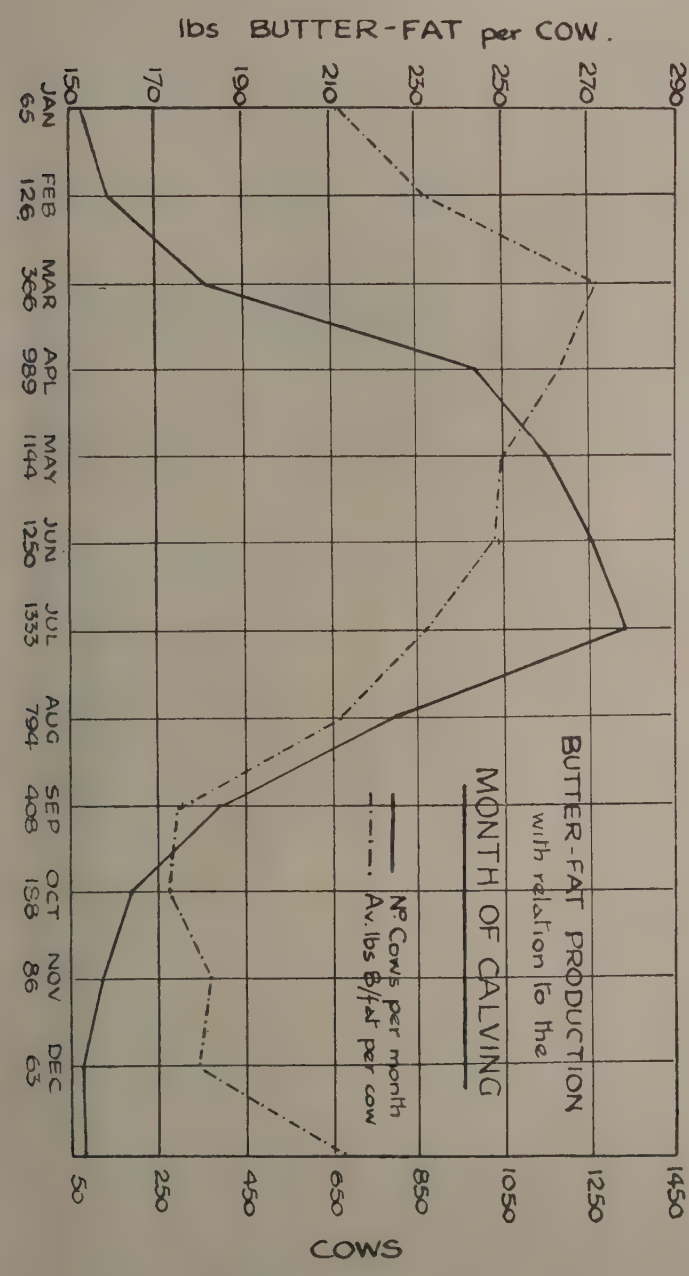
It is gratifying to notice from Table 3 that, in a number of newly developed districts in the South-West, the average production of cows is quite good, such as at Forest Grove, Rosa Brook, Vasse, Manjimup, and Greenbushes. The yields in the Albany district are disappointing but improving, and it is believed that by improvement in management, particularly regarding fodder conservation and controlling the lactation periods of cows, the yields of these cows can be raised considerably.

OPTIMUM LACTATION PERIOD.

An investigation into the records of cows in relation to the month in which they calve has been continued, and the results of the 10,000 cows under test this year corroborate those for previous seasons.

In the graph below it will be noticed that peak production was given by those cows calving during March and April with but slight reduction in yield for those calving during May and June.

In previous years, peak production has been given by cows calving during April with only a slight reduction during May and June.


lbs BUTTER-FAT per COW.
150
170
190
210
230
250
270
290
JAN 65
FEB 126
MAR 366
APL 989
MAY 1144
JUN 1250
JUL 1333
AUG 794
SEP 408
OCT 158
NOV 86
DEC 63
BUTTER-FAT PRODUCTION
with relation to the
MONTH OF CALVING
No. Cows per month
Av. lbs B/fat per cow
50
250
450
650
850
1050
1250
1450
COWS

During 1937-38 excellent rains fell in February and early March with sufficient further falls to maintain the growth of pasture thus germinated, which would account for the higher yields during March.

Present results, therefore, confirm previous advice that, for maximum production, early calving is essential, preferably during April, May, and not later than June. September to December are definitely periods during which an endeavour should be made to prevent cows commencing their lactation period.

The position as far as the various units are concerned regarding the percentage of cows which commenced lactation during this desirable period of April to June is shown in Table 4 which, however, also includes cows which commenced lactation during July.

It will be noticed in comparing the yields in columns 3 and 4 that the butter fat production of cows which calved early in the season (column 3) is in every instance in excess of the general unit average, and that in some instances the low average yield is in great part due to the small percentage of cows commencing their lactation period early in the season. For instance, in the Dardanup district approximately one-third of the cows which calved early in the year produced 244 lbs. butter fat, whilst the unit average was only 193 lbs.

TABLE 4.

Percentage of Cows completing Nine Months' Test.

1. Unit.	2. Cows.	3. Butter-fat.	4. Unit Average Butter-fat.
	%	lbs.	lbs.
A.—Donnybrook	90	282·09	275·18
B.—Serpentine	73	255·88	236·93
C.—Cookernup	48	247·63	230·83
D.—Harvey	44	228·59	208·31
E.—Brunswick	57	262·69	253·15
F.—Dardanup	29	244·29	192·98
G.—Capel	78	227·68	222·66
H.—Balingup	79	251·35	243·06
I.—Forest Grove ...	70	224·55	211·82
J.—Pemberton	66	222·77	204·49
K.—Rosa Brook ...	45	261·32	224·33
L.—Vasse	59	241·57	229·59
M.—Manjimup	65	220·07	214·28
N.—Uduc	57	231·18	216·08
O.—Benger	95	239·67	233·25
P.—Pinjarra	64	227·82	210·01
Q.—Greenbushes ...	94	226·69	217·35
R.—Brookhampton ...	84	219·43	211·13
S.—Albany...	66	197·75	185·46

WHOLE MILK PRODUCTION.

In a number of units where the percentage of cows calving early is low, it is claimed that this is necessary as, in these areas, milk is being produced for consumption as whole milk and it is necessary to calve cows more or less evenly throughout the year in order to maintain an even supply, as for instance in the Cookernup, Harvey, and Brunswick areas. In these areas the difference between the unit average and the production of cows calving during the early autumn is not as great as might be expected, because these districts have the advantage of irrigation which assists greatly in maintaining summer production.

Even under these conditions, however, it will appear from information gathered each year and shown in the above graph that, even for the supply of whole milk, it may be undesirable to commence lactations during September, October, November, and December. During these months a supply of milk can be

maintained by cows which calve early in the autumn, owing to the great flush of pasture normally available, and summer production should be provided from cows which commence their lactation period late in December, January, and February. By this practice a higher general production for the whole herd would be obtained.

It is sometimes claimed that, as herd recording is aimed particularly at raising the butter fat production of cows, those farmers interested in whole milk production would not receive any appreciable benefit from testing their herds. In Tables 2 and 3, however, it will be noted that higher butter fat productions are coupled with higher milk yields and that, since the inception of herd recording, the average butter fat test has been 4.4 per cent. to 4.6 per cent., while milk yields have increased consistently from 415 to 486 gallons per cow, and that in some districts where whole milk production is the vogue, as at Serpentine, Cookernup, and Brunswick, the milk production is above the average owing to concentration of breeds other than those for high butter fat production. In these districts the milk yield is respectively 552 gallons, 526 gallons, and 537 gallons per cow per lactation period, including those cows which calved at relatively unprofitable periods of the year. These yields under such conditions which require a minimum of hand-feeding with purchased concentrates should make whole milk production considerably more profitable than butter fat, after making due allowances for cost of deliveries and the reduced yield owing to maintaining a constant supply throughout the year.

CONTROL OF LACTATION PERIOD.

As pointed out in the annual report for the year 1936-37, success in the control of lactation periods with dairy cattle calls for careful management, particularly as regards—

1. Prevention and treatment of disease.
2. Provision of suitable fodder.
3. Control of the dairy sire.

1. *Prevention and Treatment of Disease.*

Prevention undoubtedly is preferable to cure where any disease is concerned, and, in a dairy herd, there is only one sure means of prevention and that is to start with a clean herd and then breed all the replacements that are required.

Many dairy farmers make a practice of buying cows in profit and selling later in the season as cows "dried off," the herd being again replenished by further buying. It is in such herds that diseases are usually found, the three worst being mastitis, contagious abortion, and vaginitis. The two latter diseases can be controlled definitely by avoiding the introduction of infected animals into the herd, as, without the presence of the specific germ causing the disease, an outbreak is impossible.

The writers are aware of many instances where, for a number of years, farmers' herds have not suffered from any of these diseases, and it is ascribed to the fact that these farmers have refrained from buying cows during this period.

The treatment of these diseases is described in detail in the Bulletin "Common Stock Diseases and Their Treatment" by A. McK. Clark, Chief Veterinary Surgeon, and which may be obtained free from the Department of Agriculture.

Where, however, owing to one cause or another, a large proportion of the herd has failed to conceive normally and is thus calving "out of season," the problem is "what means should be adopted to again bring these cows back to early autumn calving."

Usually cows are mated in the third or fourth month after calving, as, if conception occurs at an earlier period, the lactation is shortened which is undesirable, but, even if service should occur one month after calving, the date of com-

mencing the lactation can only be "brought back" by two to three months which is generally quite insufficient, and thus several years elapse before these "out of season" cows are again calving at a desirable time of the year, i.e., April to June. Some dairy farmers even go to the expense of selling such cows, after the first flush of their lactation period, rather than persevere for a number of years to bring them back to the correct month of calving.

Another method which has been tried by several farmers, and, in their opinion, is reported to be profitable, is to prevent those cows calving, say, from September onwards from being served with the bull, and to milk them through the summer and then through the following autumn, mating these cows normally with the remainder of the herd in July and August. It is maintained that, while such cows may not yield their maximum during the ensuing flush season, they do increase considerably over their summer production once green feed is available, and they are "brought back" to a normal calving date within one year.

With a view of obtaining definite information regarding this, a number of such "out of season" cows are being maintained under test throughout the double milking period, with a view to ascertaining whether such a system is profitable. It is hoped that information on this point will be available at the end of the present testing year 1938-39.

2. *Provision of Suitable Fodder.*

The provision of suitable fodder during the summer and early winter months is a problem that recurs annually and requires careful planning and forethought. Unless, however, there is ample fodder available for maintaining cows in prime condition during the summer months and then for continued feeding after the lactation period commences until ample pasturage is available, there is little object in arranging for early calving.

During the year under review, the quantity of fodder conserved was more than usual, due almost entirely to the nature of the season. Every effort, however, should be made to conserve all the fodder cows are likely to require, and the type of fodder to be conserved may vary with the season and from farm to farm. The principles governing conservation, however, remain the same.

(1) Ample fodder must be conserved and at least 2½ tons of fodder per milking cow calculated as hay is desirable.

It is found that those farmers whose herds are among the highest producing groups conserve more than this per head.

The highest producing herd in the scheme this year, owned by Mr. A. M. Patterson of the Vasse, consumed approximately double this quantity during the year.

(2) A second consideration is the type of fodder to conserve, which will vary with the situation of the farm. The basic consideration, however, is that cows require succulent food for the production of milk.

In irrigated districts, therefore, hay probably would be preferable for feeding with irrigated green pasture and also during winter months. On unirrigated farms, unquestionably silage should receive first attention.

The consumptive capacity of cows is not generally recognised, and instances have come under the writer's notice where, although ample fodder has been conserved, this is being given to cows in daily quantities considerably less than the cows require.

During the summer months a cow will consume 50 to 60 lbs. silage per day or 20 to 30 lbs. of good meadow hay, and it is suggested that feeders should weigh this quantity of fodder on one occasion when it is believed some surprise would be evinced at the bulk which such a weight of fodder entails.

HERDS GROUPED ACCORDING TO PRODUCTION.

In Table 5 below an indication of the general uplift which is occurring in the production of herds which have been tested for a number of years is clearly shown.

TABLE 5.

Herds Grouped according to Production.

Year.	Pounds of Butter-fat per Head.							
	Over 400.	350–400.	300–350.	250–300.	200–250.	150–200.	100–150.	Under 100.
	%	%	%	%	%	%	%	%
1933–34 ...	...	...	1·31	3·93	20·3	53·55	18·3	2·61
1937–38 ...	·26	·77	4·07	19·34	45·29	26·46	3·55	·26

It will be noted that, whereas in the first year of testing in 1933-34 nearly three-quarters of the herds under test yielded an average production of less than 200 lbs. butter fat, at the end of the fifth year of testing these low producing

A typical high-grade Jersey cow in Mr. A. Tomerini's herd, Balingup. Note absence of horns. This herd of 32 cows averaged 308.3 lbs. butter fat per cow.

herds had been reduced to 30 per cent., which, however, is still in excess of what may be regarded as satisfactory. It is believed that in a normal season, and with careful management, there should be no herds falling in those groups producing less than 200 lbs. butter fat per cow.

In the 200-250 lb. butter fat group it will be noticed that the percentage of herds has increased from 20 per cent. to 45 per cent., while the number of herds producing over 250 lbs. butter fat has gone up from 5.2 per cent. to 24.4 per cent.

COWS GROUPED ACCORDING TO PRODUCTION.

In Table 6 below the productions of mature and junior cows are given in various production groups.

TABLE 6.

Cows Grouped according to Age and Production.
(All Cows Tested less than 90 days excluded.)

Age Class.	Groups according to Butter-fat Production (lbs.).								Total Cows.
	Over 600.	500–600.	400–500.	300–400.	200–300.	150–200.	100–150.	Less than 100.	
	%	%	%	%	%	%	%	%	
Mature ...	0·04	0·13	2·15	18·88	48·42	18·00	9·17	3·21	6,311
Junior* ...	...	...	0·46	6·13	39·48	27·34	17·51	9·08	3,277

* Cows under 3 years of age at calving.

As would be expected, the production of junior cows, i.e., cows which commenced their lactation period before they were three years old, is less than that for mature cows. It is surprising, however, to notice that for 1937-38 no less than 34 per cent. of cows which were tested for more than three months fall in the

A HEAVY PRODUCER.

"Chrissie," a Fresian Jersey cross cow owned by Mr. F. Byrd, Harvey, produced 14,841 lbs. milk, 4.52 per cent. test, 671.96 lbs. butter-fat, in her last lactation.

junior class, a proportion which is unduly high and would tend to reduce the profit from herds. This proportion also was the same as for the previous year and indicates that herds are in the process of being built up consequent on the development of greater areas of pasture.

When the herd has been increased to the number which is considered suitable for any farm, and taking the average working life of a cow as six years, the percentage of heifers in herds under normal conditions need not exceed 17 per cent.

or 1 heifer for every six cows. A herd of cows built up in this proportion would average a higher production than when it is necessary for any reason to include a larger percentage of heifers.

PROVED BULLS.

Following the practice which was inaugurated last year, a further list of proved bulls having six or more daughters that have been tested and have produced over 200 lbs. butter fat has been compiled and is given below in Table 8.

TABLE 8.

Bulls with Six or more Daughters which have Produced not less than 200 lbs. Butter-fat.

Sire's Name.	No. Daughters Tested.	lbs. Butter-fat. Average Production.	lbs. Butter-fat. Average Production with age allowances.	Owner's Name.	Unit.	Age of Bull (if still living).
JERSEY:		lbs.	lbs.			Years.
White Fern of Clover Glen	7	441	441	A. M. Patterson	Vasse	
Melrose Grafter	6	373	373	R. C. Williams	Greenbushes	15 D.
Moorlands Digger	6	359	368	R. C. Williams	Greenbushes	9
Fowler's Reward of Capel	6	346	354	C. A. McCormack	Capel	
Grass Vale Montrose West	10	338	338	E. J. Manning	Uduc	11
Grass Vale Fowler's Twylish	15	270	336	J. Salerian	Cookernup	4
White Rocks Eddy	6	270	317	R. A. Clifton	Brunswick	6 D.
Moorlands Don	14	298	312		Harvey	8
Ventonia Elvera's Noble	6	232	296	Mrs. D. B. Rose	Brunswick	5 D.
Mokine Hero	8	286	295	F. Richards	Dardanup	13 D.
Euroch Moonlight	6	276	276	J. Angell	Rosa Brook	9
Garden Hill Sportsman	10	234	264	R. O. Hayward	Harvey	13
Travalgan Air Chief	17	239	253	T. M. Smith	Pinjarra	8 D.
Moorlands Dago	11	243	246	O. F. H. Bowles	Pinjarra	9
Campanile Lad	11	238	246	A. Jones	Brookhampton	10
Coronation Glenerin	8	194	232	R. E. Runciman	Brookhampton	
Juadine Philanderer	20	230	230	R. O. Hayward	Harvey	12
Colmyn Bright Star	15	175	209	T. B. Davidson	Balingup	7
AUSTRALIAN ILLAWARRA SHORTHORN:						
Hillview First Hope	6	298	364	P. Fitzpatrick	Cookernup	6
Maxicar Millions	8	293	356	E. Brockman	Balingup	7
Sarsden Laddie	7	290	352	L. C. Winduss	Cookernup	10
Tipperary Camelia II.'s Re-Echo	6	282	350	C. A. Wickham	Cookernup	6
Wooroloo Masher	6	301	317	A. L. Johnson	Uduc	13
Bright's Bill of Berry	7	298	298	L. C. Winduss	Cookernup	17
Glanavon Darius	9	249	296	P. MacNeill	Uduc	6
Wooroloo Bobs IV.	6	238	293	R. R. Graham	Pemberton	6
Sarsden Monarch	12	283	289	A. E. Taylor	Harvey	11
Summerlea Marquis	10	269	289	L. A. Mitchell	Brunswick	7 D.
Tipperary Melba's Re-Echo	6	204	254	C. L. Clarke & Co.	Brunswick	11
Nyrup Mercom	6	189	239	F. Reeve	Brunswick	6
Star of Wongong	15	229	232	M. G. Baker	Brookhampton	14 D.
Sarsden Lad 10th	8	199	227	A. E. Taylor	Harvey	4
Lowden Knight	11	211	211	E. Trevena	Brookhampton	D.
GUERNSEY:						
Brookfields Prince	7	313	338	A. R. Testar	Uduc	7
Muresk Diomede	6	224	277	Eastman & Son	Brookhampton	7
RED POLL:						
Aberbechan George	9	236	249	J. Flynn & Sons	Dardanup	9

In the Journal of Agriculture, December 1937, a list containing 53 proved bulls was published, and Table 8 contains the names of a further 37 bulls and the average production of their daughters, together with the names of the owners of the bulls. Of these bulls, nine are known to be dead, while a further nine have reached an age which probably has resulted in their sterility.

The average age of these bulls is nine years, so that, except for a few of the bulls the first heifers of which have been under test and the bulls are, therefore, about five years of age, there is little prospect of the animals in this list producing a great number of further offspring.

In view of the comparative scarcity of these proved bulls, it is hoped that all daughters of these sires, which are from cows testing over 250 lbs. butter fat and, therefore, are eligible for identification under the calf marking scheme, will be marked and registered. It is by this means that the average production of all cows in Denmark (Europe) has been increased from 85 lbs. butter fat per cow since 1885 to the remarkably high average of 257 lb. butter fat per cow for all cows in the kingdom.

HERDS GROUPED ACCORDING TO PRODUCTION AND SIZE.

The following four Tables, Nos. 9 to 12, which give the productions of leading herds grouped according to their size, yield interesting information.

In Table 9 are shown those herds in order of merit producing over 260 lbs. butter fat and consisting of less than 20 cows. It will be noted that these smaller herds, which are in districts producing butter fat only, are comprised mainly of the Jersey or Guernsey breed, one herd only being Illawarra Shorthorn and one herd Friesian. Eight herds produced over 300 lbs. butter fat compared with only four herds the previous year, whilst twenty-four produced over 260 lbs. compared with only fourteen herds the previous year, and is indicative again of the general uplift in production.

TABLE 9.

GROUP I.—HIGH PRODUCING HERDS OF LESS THAN 20 COWS.

(In order of Merit.)

Owner.	Association.	No. of Cows.	Breed.	Butter-fat.
				lbs.
R. L. Maidment	Capel	10	A.I.S.	366
O. Foan	Donnybrook	19	Jersey ...	359
P. Proctor	do.	12	do. ...	350
L. A. House	Pinjarra	12	do. ...	346
A. C. Frost	Donnybrook	14	do. ...	311
W. Darnell	Rosa Brook	19	do. ...	305
J. McEwan	Cookernup	17	do. ...	304
L. Temple	Harvey	14	do. ...	303
C. Piggott	Brunswick	14	do. ...	296
P. J. Fuller	Donnybrook	10	do. ...	294
Mrs. A. Margereson ...	Manjimup	9	Guernsey ...	284
H. L. Newman	Albany	19	Jersey × Shorthorn	282
W. J. Morgan	Manjimup	10	Jersey ...	279
F. George	Rosa Brook	17	do. ...	278
D. Bendotti	Pemberton	16	Guernsey ..	277
Mrs. M. Abbott	Pinjarra	15	Jersey	276
A. Clifford & Sons	Donnybrook ..	17	do. ..	275
R. M. Davies	Manjimup	18	do. ..	274
R. Cain	Donnybrook ..	14	do.	274
E. J. Kemp	Brookhampton ...	9	do. ...	268
G. Simmons	Dardanup	15	do. ...	268
Bell Bros.	Brunswick	14	Friesian ...	267
Mrs. E. Taylor	Vasse	16	Jersey ...	260
E. Hough	Forest Grove ...	18	do. ..	260

In Table 10 below, the improvement is even more marked in herds from 20 to 40 cows. The leading herd owned by Mr. A. M. Patterson, Vasse, was the first herd to average over 400 lbs. butter fat without any allowance under the grade herd recording scheme. The success of this herd was due to careful management, the liberal use of conserved fodder, and attention to the necessity of early autumn calving.

Mr. Patterson also has been fortunate with the Jersey bull which he owned some years ago, the seven daughters of which now in the herd averaged 441 lbs. of butter fat.

No less than 13 herds in this group of medium size herds exceeded 300 lbs. butter fat per cow compared with only five the previous year, and 26 herds exceeded 280 lbs. butter fat compared with only 10 the previous year.

TABLE 10.

GROUP II.—HIGH PRODUCING HERDS OF FROM 20-40 COWS.

(In order of Merit.)

Owner.	Association.	No. of Cows.	Breed.	Butter-fat.
				lbs.
A. M. Patterson	Vasse	24	Jersey	406
C. J. Cunningham ...	Donnybrook	21	do. ...	353
S. Bowers	Brunswick	26	do. ...	338
W. J. Sears	Donnybrook	24	do. ...	332
F. G. Williams	Pinjarra	26	do. ...	319
E. J. Kentish	Serpentine	32	do. ...	319
S. C. Maidment	Balingup	29	Jersey × Shorthorn	313
S. Johnston	Vasse	24	Jersey ...	312
G. S. Blaikie	Rosa Brook	21	do. ...	311
A. Tomerini	Balingup	32	do. ...	308
F. Heywood	Greenbushes	25	do. ...	307
L. Westcott	Serpentine	22	A.I.S.	306
T. Tyrell	Dardanup	22	Jersey ...	303
T. B. Stanley	Benger	23	A.I.S.	298
R. A. Clifton	Brunswick	21	Jersey ...	296
M. Brennan	Balingup	20	Jersey × Guernsey	296
S. Carlsson	Benger	26	Jersey ...	295
W. K. Barnes	do.	28	Shorthorn × Jersey	293
Ellis Bros.	Brunswick	32	A.I.S.	292
A. Millar	Rosa Brook	25	Jersey ...	292
T. G. Hutton	Capel	31	Friesian ...	291
S. H. Fry	Benger	38	A.I.S.	285
D. H. Bell	Vasse	25	Jersey × Shorthorn	284
T. H. Ellis	Balingup	23	Jersey ...	284
D. Strachan	Dardanup	24	do. ...	282
M. Kilrain	Manjimup	25	Guernsey ...	281

In Table 11 is given a list of those herds of from 41 to 60 cows producing more than 229 lbs. butter fat per cow. High productions in these large herds is particularly difficult to attain and equally difficult to maintain.

The production of the herd owned by Mrs. D. B. Rose in the Brunswick unit is interesting as showing the results which may be obtained by the use of the information supplied from the scheme. The following figures indicate the increase in production during the three years that this herd has been under test:—

Year.	Number of Cows.	Average Butter-fat.	Total Butter-fat.
		lbs.	lbs.
1935–36	70	185.1	12,957
1936–37	62	210.84	13,072
1937–38	51	293.94	14,991

It will be seen that the average butter fat production of the herd has been raised by nearly 60 per cent. during these three years. During the last year of

testing when the herd comprised 19 less cows, the total butter fat produced was 2,034 lbs. in excess of that given during the first year of testing. During this period, over 30 cows have been culled and replaced by stock bred on the farm.

Over-stocking probably resulted in the low yield during 1935-36, and special care is being taken to prevent this recurring.

Hauling subterranean clover to the silage trench. Mr. J. Littlefair, Pemberton.

Another herd which has shown a marked increase in production is that owned by Mr. R. C. Williams, Bridgetown. The average production of this herd has been raised by 78 lbs. during the two years' testing period.

In this group of herds also, the average production shows considerable increase over that for the previous year. Six herds averaged over 270 lbs. butter fat, whereas in this class of 41 to 60 cow herds the previous year, the highest producing herd only yielded 261 lbs. butter fat per cow.

TABLE 11.

GROUP III.—HIGH PRODUCING HERDS OF FROM 41-60 COWS.

(In order of Merit.)

Owner.	Association.	No. of Cows.	Breed.	Butter-fat.
				lbs.
Mrs. D. B. Rose ...	Brunswick	51	Jersey ...	294
R. C. Williams	Greenbushes	43	do. ...	293
P. Fitzpatrick	Cookernup	60	A.I.S.	284
A. & A. E. Millar ...	Forest Grove ...	43	Jersey ...	278
D. Scott	Balingup	43	do. ...	275
J. V. Dolcy	Serpentine	45	A.I.S.	270
C. Somerset	Balingup	52	Friesian × Jersey	257
W. Irwin-Flannagan ...	Capel	44	A.I.S.	248
H. P. Fry	Benger	44	do.	248
C. A. McCormack ...	Capel	41	Jersey ...	243
J. H. Brett	Dardanup	51	do. ...	235
K. H. Clifton	do.	42	Guernsey ...	229

In Table 12 the five leading herds of over 60 cows is given in order of merit, the productions of all being meritorious when the size of the herds are taken into account.

TABLE 12.

GROUP IV.—HIGH PRODUCING HERDS OF OVER 60 COWS.

(In order of Merit.)

Owner.	Association.	No. of Cows.	Breed.	Butter-fat.
				lbs.
J. Salarian	Cookernup	66	Jersey ...	266
G. M. Dempster	Benger	61	do. ...	243
J. P. Norton	Capel	81	A.I.S.	237
J. Neil	Cookernup	64	Jersey × Shorthorn	231
C. A. Wickham	do.	69	A.I.S.	225

Each year a list of the 20 leading cows in the scheme is published in the form shown in Table 13 below. This is the first year during which the production of individual cows has exceeded 600 lbs. butter fat for the lactation period, and two cows, namely, "Belle"—a Jersey cow owned by Mr. C. Piggott, Brunswick, with a production of 641 lbs. butter fat, and "Gentle"—a Shorthorn cow owned by Mr. R. L. Maidment, Capel, with a production of 620 lbs. butter fat, have broken new ground. The average production of these 20 cows was 526 lbs. butter fat compared with an average of 472 lbs. per cow for the 20 leading cows during the previous year, and indicates that, with management and the inherent capacity of the cow for production, yields comparable with those in other countries can be obtained in Western Australia.

TABLE 13.

TWENTY LEADING COWS—ALL UNITS.

Owner.	Unit.	Name of Cow.	Breed.	Tattoo.	Test.	Butter-fat.
					%	lbs.
C. Piggott	Brunswick	Belle	Jersey	E.G. 1	4·99	640·95
R. L. Maidment	Capel	Gentle	Shorthorn	G.W. 8	4·84	619·74
C. Foan	Donnybrook	Poppy	Jersey	A.L. 20	5·75	577·97
R. C. Williams	Greenbushes	Maggie VI.	do.	Q.S. 23	5·07	547·15
Ellis Bros.	Brunswick	Jenny	Shorthorn	E.B. 10	5·21	545·81
W. Darnell	Rosa Brook	Dolly	Jersey	I.U. 14	5·05	545·64
T. Jamieson	Capel	Betty II.	Shorthorn	G.S. 1	5·75	541·03
F. Byrd	Harvey	Chrissie	Friesian ×	D.T. 18	4·26	531·81
T. Jamieson	Capel	Pickles	Shorthorn × Jersey	G.S. 8	5·72	531·54
Do.	do.	Melba	do. do.	G.S. 12	6·08	517·44
A. M. Patterson	Vasse	Katy	Jersey	L.B. 3	5·34	514·10
A. Tomerini	Balingup	Maghy	do.	H.J. 17	5·99	508·86
S. Bowers	Brunswick	Coral	do.	E.F. 33	5·49	502·62
A. M. Patterson	Vasse	Lanky	do.	L.B. 8	4·75	494·42
Do.	do.	Topsy	do.	L.B. 9	5·35	492·02
L. Westcott	Serpentine	Maggie	Shorthorn ×	B.G. 15	4·91	487·11
P. Proctor	Donnybrook	Dainty	Jersey	A.F.* 13	6·72	486·54
M. Kilrain	Manjimup	Bella	Guernsey	M.C. 6	5·60	483·10
P. Fitzpatrick	Cookernup	Flossie	Shorthorn × Jersey	9C. 10	5·40	477·25
W. Darnell	Rosa Brook	Tiny	Jersey	I.U. 13	5·90	475·00

* F reversed.

The "Sunny-West" Cup presented by the South-West Co-operative Dairy Farmers Ltd., to the owner of the four highest producing cows in any herd tested under the grade herd recording scheme has again been won by Mr. T. Jamieson of Capel. It is pleasing to record that these cows did not receive concentrates other than those which can be grown on the farm.

The records of these cows are as follow:—

Name of Cow.	Milk.	Butter-fat.
	lbs.	lbs.
Betty 2nd	9,393	541.03
Pickles	9,285	531.54
Melba	8,502	517.44
Stella	8,573	463.01
Average	8,938	513.25

It also is interesting to notice that three of these same cows were also in Mr. Jamieson's team of the winning four the previous year, and that in each instance their productions are considerably higher during the year under review.

Ample fodder conservation on Mr. J. Littlefair's farm, Pemberton.

While the improvement which has been recorded is no doubt in part ascribable to the good season which has been experienced, herd recorders report an increased attention by members to the utilisation of the information given each month and that the high yields are in no small part due to greater conservation of fodder which was fed during early autumn months, and in some areas the sowing of early oats for grazing.

There is also a tendency for the sub-division of large paddocks, so that they may be utilised for rotational grazing, and, with this, the practice of using larger applications of superphosphate for topdressing is developing.

AVERAGE PRODUCTION OF ALL UNITS.

The production of all units which were under test during 1937-38 is given in Table 14 below.

TABLE 14.

Donnybrook "A."	No. of Cows.	Butter-fat Average.	Serpentine "B."	No. of Cows.	Butter-fat Average.
		lbs.			lbs.
O. Foan ("L")	19	358·83	E. J. Kentish ("K") ...	32	318·63
C. J. Cunningham ("H")	21	353·40	L. Westcott ("G") ...	22	305·96
P. Proctor ("F*") ...	12	350·62	J. V. Doley ("A") ...	45	269·54
Herd A	24	331·66	Herd T	35	257·33
„ C	14	311·38	„ D	20	248·55
„ W	10	294·38	„ H	21	248·10
„ E*	33	277·98	„ U	14	246·41
„ G*	17	275·33	„ M	12	235·78
„ A2	14	273·78	„ V	30	234·65
„ E	32	272·06	„ O	31	231·91
„ D	27	271·51	„ L	8	231·32
„ F	27	266·96	„ S	28	203·02
„ A*	24	253·75	„ N	6	202·86
„ Z	36	247·15	„ I	25	200·11
„ C*	21	243·52	„ E	13	199·80
„ K	28	241·59	„ C	15	172·29
„ B*	10	240·47	„ X	14	171·12
„ P*	7	236·20	„ P	25	149·71
„ X	23	222·04			
„ L*	20	189·11			

* Letter reversed.

Cookernup "C."	No. of Cows.	Butter-fat Average.	Harvey "D."	No. of Cows.	Butter-fat Average.
		lbs.			lbs.
J. McEwan ("CY") ...	17	304·13	L. Temple ("C") ...	16	303·31
P. Fitzpatrick ("9C") ...	60	283·85	Mrs. A. Eckersley ("E")	26	262·34
T. Twaddle ("J*") ...	20	279·51	E. Holthouse ("AC") ...	19	259·34
Herd B	35	271·84	Herd AL*	26	253·01
„ CS	66	266·25	„ T	32	239·46
„ D*	21	256·50	„ N	30	238·54
„ R*	11	247·04	„ P	42	230·80
„ P*	22	245·69	„ AO	14	228·51
„ L	31	241·03	„ AD	26	207·31
„ E*	26	235·71	„ R	30	206·10
„ T	28	232·78	„ AG	16	205·35
„ 7C	64	231·50	„ G	30	201·91
„ P	34	231·18	„ I	36	198·80
„ Q	37	229·04	„ A	41	196·26
„ 8C	22	228·74	„ AB	24	187·42
„ F	69	224·83	„ W	26	185·94
„ T*	16	222·89	„ AM	38	181·90
„ 2C	13	210·48	„ AN	15	175·72
„ J	44	197·81	„ V	58	132·47
„ G	31	188·43			
„ D	34	184·34			
„ W	11	175·42			
„ F*	33	153·79			

* Letter reversed.

TABLE 14—*continued.*

Brunswick "E."	No. of Cows.	Butter-fat Average.	Dardanup "F."	No. of Cows.	Butter-fat Average.
		lbs.			lbs.
S. Bowers ("F") ...	27	338·28	T. Tyrell ("V") ...	22	303·18
R. A. Clifton ("A*") ...	23	296·49	D. Strachan ("C") ...	24	282·09
C. Piggott ("Q*") ...	14	295·97	C. Gilmour ("E") ...	24	276·16
Herd B*	53	293·94	Herd AH	15	267·54
„ B	37	292·56	„ I	17	257·16
„ Q	24	278·55	„ 5	17	246·63
„ C*	36	273·31	„ A	51	235·25
„ M*	27	269·99	„ K	34	230·17
„ R*	23	269·98	„ W	17	229·51
„ P*	16	267·07	„ N	42	229·44
„ H	31	262·79	„ AC	24	217·84
„ E	30	245·04	„ V*	29	212·43
„ K*	24	235·03	„ AE*	39	212·06
„ E*	19	234·30	„ AD*	43	208·07
„ U	29	220·58	„ M	24	207·21
„ T	26	219·80	„ AE	18	204·80
„ A	48	218·38	„ AJ*	106	182·21
„ L*	40	215·05	„ AB*	20	146·60
„ X	47	211·29	„ D*	22	142·56
„ T*	21	198·36	„ AI	55	141·99
„ D*	11	176·12	„ AI*	72	134·56
			„ AC*	34	131·35

* Letter reversed.

Capel "G."	No. of Cows.	Butter-fat Average.	Balingup "H."	No. of Cows.	Butter-fat Average.
		lbs.			lbs.
L. R. Maidment ("W")	10	366·07	S. C. Maidment ("S")	29	313·47
G. Hutton ("N") ...	31	291·17	A. Tomerini ("J") ...	32	308·29
T. Jamieson ("S") ...	29	279·56	M. Brennan ("R") ...	20	295·67
Herd M	36	264·58	Herd N	29	284·24
„ C	31	249·60	„ A*	31	279·81
„ H	44	248·30	„ U	36	276·97
„ D	38	246·20	„ K	43	274·63
„ F	41	242·81	„ V	35	263·13
„ A	81	237·44	„ C	39	258·92
„ K	32	235·68	„ K*	52	257·48
„ I	40	233·08	„ B*	24	247·32
„ P	14	232·24	„ D*	16	237·07
„ L	79	189·23	„ HS	24	236·09
„ G	33	187·31	„ D	22	234·21
„ B	54	177·59	„ E	20	233·13
„ T	34	168·48	„ H4	20	220·10
„ E	37	158·10	„ P	38	219·37
„ O	25	156·55	„ H8	25	215·71
			„ Q	17	198·14
			„ H7	19	194·13
			„ E*	14	194·10†
			„ G*	51	190·72
			„ M	47	146·81

* Letter reversed. † Tested 6 months only.

TABLE 14—*continued.*

Forest Grove "I."	No. of Cows.	Butter-fat Average.
		lbs.
T. A. Fenning ("N") ...	31	278·965
A. & A. E. Millar ("G")	43	277·920
E. Hough ("H") ...	18	260·033
Herd V	16	252·924
„ U	20	247·007
„ D	40	226·513
„ O	23	225·482
„ P*	18	220·685
„ F*	31	216·916
„ L	14	202·490
„ B*	20	198·132
„ A	18	194·506
„ Z	15	194·348
„ S	17	183·746
„ C	15	182·758
„ Q	24	176·790
„ K*	19	176·727
„ X	27	173·303
„ W	16	168·377
„ J	13	165·830
„ R*	16	160·341
„ E*	34	158·096

Pemberton "J."	No. of Cows.	Butter-fat Average.
		lbs.
D. Bendotti ("U") ...	16	277·10
R. R. Graham ("G") ...	16	254·70
D. Della ("N") ...	13	241·15
Herd F	18	235·68
„ O	21	234·34
„ B	18	232·37
„ I	20	230·80
„ C	14	222·02
„ Q	20	213·22
„ A	16	209·69
„ E	23	206·67
„ L	15	206·31
„ T	10	205·33
„ H	14	182·46
„ W	12	173·60
„ R	25	171·54
„ P	15	171·03
„ K	15	164·73
„ V	18	149·65
„ X	15	107·69

* Letter reversed.

Rosa Brook "K."	No. of Cows.	Butter fat Average.
		lbs.
G. S. Blaikie ("L") ...	21	310·51
W. Darnell ("U") ...	19	305·22
A. Miller ("M") ...	26	292·35
Herd Q	17	278·27
„ I	19	251·54
„ A	30	251·12
„ E	13	246·80
„ B	32	242·07
„ Z	15	240·08
„ Y*	20	239·94
„ A*	15	233·14
„ C	27	232·74
„ X	20	213·26
„ T*	15	209·53
„ S	18	207·56
„ R	13	206·64
„ H	28	205·43
„ W	19	204·36
„ F	24	200·96
„ J*	15	194·36
„ P	16	193·07
„ D	35	182·06
„ J	20	179·51
„ Y	18	141·94
„ G	20	130·62

Vasse "L."	No. of Cows.	Butter-fat Average.
		lbs.
A. M. Patterson ("B")	24	406·32
L. Johnston ("C") ...	24	311·65
D. H. Bell ("Z") ...	29	284·37
Herd K	16	260·42
„ G	22	258·07
„ M	20	249·45
„ T	40	244·01
„ I	33	236·85
„ U	13	223·56
„ E	26	223·18
„ H	37	221·43
„ Y	24	218·59
„ D	25	215·44
„ V	11	213·86
„ J	20	208·87
„ X	20	205·34
„ R	14	196·53
„ F	20	193·93
„ P	12	177·94
„ O	11	172·66
„ W	15	167·90
„ Q	20	161·64
„ A	13	107·31

* Letter reversed.

TABLE 14—*continued.*

Manjimup "M."	No. of Cows.	Butter-fat Average.
		lbs.
Mrs. A. Margereson ("E")	9	283·51
M. Kilrain ("G") ...	25	281·23
W. T. Morgan ("I") ...	10	279·36
Herd O	18	273·88
„ B*	21	267·10
„ B	22	248·61
„ C*	20	237·03
„ R	16	230·49
„ N	13	227·87
„ A	57	220·94
„ U	20	214·83
„ Q	17	212·38
„ X	30	211·30
„ P	20	195·14
„ E*	26	184·43
„ S	42	182·05
„ D*	19	178·29
„ V	11	174·97
„ T	25	170·95
„ Y	44	161·21

Uduc "N."	No. of Cows.	Butter-fat Average.
		lbs.
P. MacNeill ("NC") ...	35	264·12
A. R. Testar ("CE") ...	25	263·31
E. J. Manning ("EH")	31	255·11
Herd NM	21	249·63
„ ND	24	247·85
„ NV	17	235·94
„ NU	34	221·33
„ NB	19	218·61
„ NS	27	215·41
„ NJ	18	212·00
„ NA	18	193·39
„ NR	33	192·14
„ NK	14	189·82
„ NL	28	173·33
„ NT	15	166·44
„ NF	31	164·15
„ NO	19	163·64

* Letter reversed.

Benger "O."	No. of Cows.	Butter-fat Average.
		lbs.
T. B. Stanley ("M") ...	23	297·99
S. Carlsson ("I") ...	26	294·75
W. K. Barnes ("G") ...	28	292·88
Herd F*	38	284·98
„ W	29	267·95
„ J	44	247·79
„ H	20	244·079
„ E	61	243·05
„ L	22	235·878
„ D	22	234·108
„ U	25	230·149
„ B	18	215·39
„ T	17	213·65
„ S	13	190·75
„ C	35	179·527
„ A	75	176·47
„ R	13	166·115
„ K	13	159·72

Pinjarra "P."	No. of Cows.	Butter-fat Average.
		lbs.
L. A. House ("L") ...	13	345·63
F. G. Williams ("M") ...	27	319·21
Mrs. M. Abbott ("U")	15	275·71
Herd G	26	241·11
„ A	31	234·53
„ B	31	232·92
„ Y	38	226·22
„ V	11	223·89
„ J	19	216·30
„ F	15	208·42
„ N	16	196·52
„ T	79	192·15
„ D	20	189·20
„ R	46	189·00
„ K	24	187·69
„ X	14	186·49
„ AB	11	180·87
„ Z	27	175·54
„ I	30	165·03
„ C	23	164·63
„ W	18	154·85

* Letter reversed.

TABLE 14—*continued.*

Greenbushes "Q."	No. of Cows.	Butter-fat Average.	Brookhampton "R."	No. of Cows.	Butter-fat Average.
		lbs.			lbs.
F. Heywood ("H") ...	25	306·653	E. J. Kemp ("T") ...	9	267·72
R. C. Williams ("S") ...	43	293·458	F. Leach ("C*") ...	16	250·84
A. Lindsay ("M") ...	30	251·750	C. F. Matthews ("X") ...	19	248·42
Herd W	19	251·208	Herd C	7	244·39
„ N	20	247·067	„ N ...	13	239·98
„ I	22	245·210	„ D*	13	239·55§
„ V	29	237·670	„ B*	28	239·45
„ Y	24	231·105	„ E	21	232·77
„ B	18	226·51	„ S	14	225·14§
„ J	20	226·288	„ G*	42	210·32‡
„ G	21	224·107	„ G	38	206·47
„ K	23	223·57	„ E*	13	205·35
„ F	22	218·826	„ P	13	202·20
„ R	16	218·690	„ A*	23	200·90‡
„ T*	17	205·250	„ Z	15	196·92
„ L	19	203·380	„ D	16	195·90†
„ E	24	199·651	„ K	13	195·25
„ P	32	192·380	„ Y	12	187·55
„ T	21	187·298	„ F*	72	183·00
„ O	20	181·150	„ R	10	144·66
„ U	40	180·620			
„ A	30	173·990			
„ D	48	172·550			

* Letter reversed. † Tested 6 months. ‡ Tested 7 months. § Tested 8 months.

Albany "S."	No. of Cows.	Butter-fat Average.	Albany "S"—*contd.*	No. of Cows.	Butter-fat Average.
		lbs.			lbs.
H. L. Newman ("B") ...	19	281·99	Herd V	8	211·23
G. T. Hill ("Z") ...	3	241·99	„ E	17	207·21
T. Knapp ("K*") ...	14	239·69	„ G	16	194·62
Herd P	11	238·52	„ I	35	190·97
„ X	17	228·21	„ O	18	180·13
„ J	9	221·55	„ F	13	171·99
„ R	12	218·08	„ Y	18	155·31
„ A	30	217·31	„ H	35	153·26
„ L	22	215·06	„ C*	25	150·26
„ D	5	211·97	„ T	50	92·98

* Letter reversed.

SHORT TALK ON SEASONAL WORK IN THE ORCHARD.

GEO. W. WICKENS,
Superintendent of Horticulture.

Broadcast Address from Perth National Broadcasting Station, 6WF, on Friday, 6th May, 1938, with notes added on 16th August, 1938.

I have selected "pruning" as the subject for to-night's talk on seasonal work in the orchard, but I want at once to assure listeners that I have no intention of attempting to traverse either in detail, or generally, the many methods adopted in training the various kinds of orchard trees from the time they are planted until they reach the age of profitable production. A written description of the work entailed would fill many pages of a fairly big text book, and would need supplementing with numerous photographs and drawings, for not only is

there a best method of pruning the different kinds of trees, such as stone fruits, pome fruits, citrus fruits, etc., but the methods to be adopted vary for different varieties of the same kind. For instance, what is correct procedure with one variety of apple tree may be quite wrong with another, and the variation goes still further, for what may be correct with a strongly growing tree may be wrong with a tree of the same variety which is only making weakly growth. I have instanced apple trees because I intend to speak about them to-night, but the same statement holds good to a greater or lesser extent with practically all kinds of fruit trees, and I don't wonder the beginner becomes confused when he reads of leaders, sub-leaders, laterals, ramified spurs, fruit buds and leaf buds. I well remember one of these standing in front of a fruit tree with a secateurs in one hand and a text book in the other and saying, "His trouble was that the trees he had to prune did not grow in the same shape as those depicted in the illustrations."

In speaking to-night to commercial apple growers, I hasten to say that I realise there are some of them who know all about pruning. I am aware of this because they have told me so, and to these I am sorry I have nothing to offer, but I also know there are many who, like myself, have had a lifetime's experience of the work and who, in company with me, have to confess they are far from being satisfied that the orthodox method of pruning apple trees, as carried out generally in Western Australia, is yielding maximum good results.

Orthodox methods may be briefly described as follows:—In the first year's winter pruning, assuming the trees are headed and not whips, the shoots are reduced to three or four which are spaced so as to provide the tree with an open centre, and these three or four shoots, which later form permanent main arms or leaders, are shortened back to five or six buds from the fork. The following winter, whether the tree has made strong or weak growth during the intervening spring and summer, the leading growths are again shortened severely; the permanent main arms are increased, if possible, to five or six, and the open centre is still retained. This treatment—hard pruning of leading growths—continues for the first six to seven years of the tree's life, and during that time, if the tree has grown well, it will have produced very little fruit. If the laterals have been stubbed back, as commonly practised with young trees, the yield will have been practically nil, but if these have been left, the lighter growing ones will have produced some fruit in the sixth and seventh years.

The object of pruning the leaders each year hard back to about one third of the length of the annual growth is to produce a sturdy tree that will stand up against wind and rough weather and carry crops of fruit without needing props to prevent the limbs from breaking; and the method outlined does undoubtedly give this result. I think, however, we have been too prone to take for granted that hard cutting is the best way to treat the leaders of a strongly growing apple tree until it settles down to cropping in its seventh or eighth year, and I will mention first a very common fallacy which is held by the majority of pruners, who believe that winter pruning causes a limb at the place where it is cut to grow to greater dimensions than it would have grown had it been left unpruned. That this belief is wrong can be ascertained in one season by cutting some limbs of a strongly growing young apple tree and allowing others to remain unpruned, and, after the season's growth has finished, measuring the circumference of the pruned limbs at places where the cuts were made, and the unpruned ones at the points where the cuts would have been: in practically every instance the unpruned limbs will be found to be of greater dimensions than the pruned ones. It will be noted I have said the growth will be greater. I have not said the limbs will be stronger for this is not a fact. The unpruned

limbs will be willowy and easily bent, while the pruned limbs will have been stiffened by the joints made as a consequence of the cuts.

During the last few years, however, I have become more and more firmly convinced that we are adhering too rigidly to the orthodox apple tree with leaders stiffened at every 18 inches of their length by severe cutting, and it surely must strike anyone as a wasteful practice to fertilise, cultivate and by clever husbandry induce a tree to make upwards of six feet of growth in one summer season and then, with one violent action in winter, reduce that growth to about 18 inches.

To test my belief that an apple tree with unpruned leaders would, in its early years, make more growth and produce more fruit than an apple tree pruned in the orthodox fashion, I arranged with Mr. George Parke, of Donnybrook, to let me have the training of one of his Granny Smith apple trees from the first season after it was planted as a whip. Mr. Parke is a genuine orchardist, who has an affection for his apple trees, as trees, quite apart from their value as revenue producers, and it was only after some mental strain and severe heart-burnings on his part that he agreed to my request, for to him it was like handing over a well beloved child to a stranger for guidance and training. The tree selected was one of a block of several hundred whips planted in the winter of 1930, and, with the exception of the one cut it received at the time of planting, the leaders have never been shortened since. In the first year three main arms developed about 15in. from the ground: in the second year these increased to six, and in the third to 13, and these 13 form the framework of the tree on which I have trained numerous sub-branches and laterals. At the end of only the first season's growth, the tree's greater height than any other in the plantation was quite noticeable, and the difference became more marked each year until at six years from planting it was feet taller, and the trunk inches greater in circumference than any other tree in the block.

Though the leaders have never been shortened by pruning, I want to stress the fact that the training occupied more time than is taken when pruning a tree in the orthodox manner. In the first place, instead of relying on well-placed cuts to provide the tree with an open centre, this result had to be obtained by tying the limbs to stakes for the first two seasons, and to prevent fruit from setting at the terminals of the leaders I removed the blossoms in the spring of 1931, 32 and 33. The winter pruning also took much longer than the ordinary method for, as orchardists will have noticed, the buds at the terminals of all shoots are much closer together than they are lower down, and this means that an uncut leader will send out from the end anything from three to six growths, and all but the top one was either cut right out or shortened back to a spur. In ordinary pruning this would have been represented merely by one or two cuts. The tree was kept open for light and air by removing small branches from the centre and suitable laterals were chosen and retained for fruit production.

Just in the same way as the tree left all its companions behind in growth, so it did in bearing. In 1934, in its fourth year, it produced one case of fruit; in 1935, 4½ cases; in 1936, 8 cases; in 1937, 8 cases, and this year, 1938, in its eighth year, it produced 10 cases. In the quantity of fruit stated no notice has been taken of windfalls, the cases mentioned being those actually picked and packed from the tree. So from the fourth year to the eighth year inclusive of the tree's life, it provided Mr. Parke with 31½ cases of apples, and I particularly wish to mention here that it carried the crop of 10 cases this year without any supporting props, the only assistance the tree received being that given by a piece of wire encircling the branches so that the stronger limbs helped the weaker ones to stand the strain.

In referring now to the 400 trees in the same block, pruned in the orthodox manner, I want to emphasise the fact that they have received the personal attention of the owner (Mr. George Parke), who is a past-master in the art of pruning. He has given every tree a wide base; has allowed ample room for light and air circulation between the main arms, which he has clothed with well-spaced laterals, but the very vigour of the trees under that system of pruning prevented them from bearing at an early age.

I will relate now the history of the production of the 400 trees pruned in the orthodox manner and the one with unpruned leaders. All trees were planted in 1930. First crop was produced in 1934 and comprised one case on the experimental tree; 1935, total crop 35 cases of which 4½ cases were borne by the experimental tree; 1936, total crop 66 cases, 8 cases on experimental tree; 1937, total crop 199 cases, again 8 cases on experimental tree; 1938, total crop 643 cases, 10 cases on experimental tree.

It will be seen that the total crop produced by 400 trees in eight years from planting amounted to 943 cases, and of these the experimental tree produced 31½. Had the 400 pruned trees cropped like the experimental tree the production in the same time would have been 12,600 cases, or, allowing that the average would be less over the full 400, and taking, say, 25 cases instead of 31½, the production would still have reached the highly satisfactory total of 10,000 cases. And in this year, 1938, had the remaining 400 trees produced equally with the experimental tree instead of 643 cases, Mr. Parke would have had 4,000 cases for sale.

I know to many growers these figures will sound fantastic. Certainly they are sufficiently arresting to cause one to think seriously, and my advice to doubting orchardists is to choose a piece of really good land, plant out 100 Granny Smith apple trees, scatter a few Jonathans and Yates amongst them for cross pollination purposes, make the trees grow strongly, treat the Granny Smiths as I have suggested and bank the profits. Charles Dickens makes one of his characters say, "Train up a tree in the way it should grow, and when it grows big sit under the shade of it." Well, if shade is the main consideration, prune hard and vigorously; if fruit is desired early in the tree's life, try the unpruned leader system.

To those who think hard winter pruning makes a tree grow, I would point out that the experimental tree now measures 16ft. 6in. in height and 15ft. in width through the branches, and the biggest pruned tree in the block is only 11ft. in height and 8ft. 6in. in width. Not only is it the tree with the greatest dimensions and capacity for bearing fruit, but I am convinced it has a stronger constitution than any of the pruned trees due to the fact that the sap flows in a comparatively straight line from the roots to the tops of all main limbs. And though I have no proof I am quite prepared to believe that hard pruning is one of the contributory causes of "Die-back," which so often puzzles us by appearing in what are otherwise apparently healthy trees.

My time is nearly up, and now that I am well astride of my hobby horse I regret exceedingly that I cannot continue riding it for a longer period, for there are pitfalls in the system advocated. The grower who thinks that I am handing out advice that if followed will lessen the time he now occupies in winter pruning has a heap of other thoughts coming to him, and I would strongly advise those interested to communicate with me at the Department of Agriculture, when I shall be only too delighted to discuss the matter with them. If any keen orchardist amongst my listeners takes my advice about trying a small experiment with 100 trees I can assure him he will find it more entertaining than the pictures, and more profitable than going to the races: but remember, the system advocated is not suited to weakly growing trees.

NOTES ADDED ON 16th AUGUST, 1938.

Since the above broadcast was delivered on the 6th May, I have given demonstrations and talks on the subject in most of the principal apple growing districts in the State, and as a result there are now some hundreds of trees that have been treated this pruning season in the manner advocated. To those who were not present at the demonstrations, and who may decide to give the new method a trial, I wish to sound a word of advice regarding supporting, by staking, the unpruned limbs in the first and second season. The stakes are merely pieces of sawn timber 6ft. x 1in. x 1in., or their equivalent in props cut direct from the forest. The ends should be driven into the soil close to the butts of the trees so as not to be in the way of implements, and then the stakes should slope outward one to each limb at an angle that will bring the tops of the year's growths to approximately where they would have reached had the tree been pruned in the ordinary manner.

The necessity for staking only arises when upright growers, such as Granny Smiths and Cleopatras, are being treated. These, if left unpruned and unstaked, will grow with centres so close and dense as to interfere with cropping; but care must be taken not to prop the trees out too widely, nor bend the young growths abruptly outwards, for this will cause the over-bent limbs to put out strong growths on the insides, or rather upper sides, of the limbs and check the terminal growths.

Three photographs of the experimental tree are shown hereunder:—No. 1 was taken in November, 1934, when the tree was in its fourth year, and shows the size in comparison with the trees pruned in the orthodox manner; the lack of leaves on all trees was due to the photograph being taken in early November before the trees were fully foliaged. No. 2 is a photograph taken on the 20th July of this year, and shows that the tree, in spite of having borne heavy crops in the last three years, and with very little propping, has retained its shape and the limbs have neither been unduly bent nor broken.

It also shows the method by which the tree has been furnished with bearing wood from bottom to top by using lateral growths for the purpose and avoiding short spurs. I stated in the broadcast that if laterals have been stubbed short, trees when six to seven years of age will have produced practically no fruit and this is true of strongly grown trees, whether leaders have been pruned or left unpruned. It is a fact that many apple growers still continue the practice of spurring nearly all laterals at time of winter pruning (and some do it both in Winter and Summer) with the object of causing the fruit to be borne on short growths and ramified spurs situated close to the main leaders, and under this treatment an apple tree will produce very little fruit until it is upwards of eight years of age. Whereas if full use is made of the laterals by leaving unpruned the light and medium sized ones—which grow horizontally or nearly so from the leaders—fruit buds will be furnished in the second year of the laterals' growth. Growths which are too strong and upright to leave for laterals can be pruned in winter to buds on the under sides, until their vigour is checked and their direction is less upright and then left unpruned to furnish fruit buds. When the fruit buds are formed it is a simple matter to prevent over cropping by shortening the laterals as required. .

It is, I think, universally known that the best Jonathans for size, colour and quality, are produced on laterals, but it is not so generally recognised that this is equally true of Yates, Dougherty, Granny Smith and many others.

Photo. No. 3 was taken at the same time as Photo. No. 2 and is reproduced to show the full size of the tree at eight years old.

In conclusion, I wish to emphasise the fact that except for the difference in the methods of pruning, the experimental tree received exactly the same treatment as the remainder of the plantation, cultivation and manuring being uniform throughout.

WITHER TIP OR SUMMER DIEBACK.

T. C. Dunne, Agricultural Adviser.

There has apparently been a tendency in some quarters to confuse "Wither Tip" disease of apple trees with the more general type of dieback termed "Pruning Dieback." To date there is no evidence that any connection exists between the two diseases, or that copper applications which have proved effective in controlling "Wither Tip" are of any use in the treatment of the other disease.

A discussion of "Wither Tip" was published in the Journal of the Department of Agriculture in March, 1938. This trouble is characterised by the withering back in December or January of shoots which made growth during the spring and early summer. On the other hand with "Pruning Dieback" it is noticed that the leaders fail to develop vigorous spring growth at all, the leaves being often very small and giving a rosetted appearance to the shoots.

With a view to controlling the "Wither Tip" disease soil applications of copper sulphate may be made during August or September. Copper sulphate fines applied at the rate of 1 lb. per tree for young trees and 2 lbs. per tree for trees of bearing age has proved satisfactory. The material should be spread in a ring over an area extending about three to six feet from the tree and dug in thoroughly. In the case of older trees it may be necessary to follow with a summer strength Bordeaux spray (3.3.40) towards the end of November in order to present any recurrence of the disease. After the first season's treatment it should be possible to discontinue the spraying.

VARIETIES OF PEDIGREE SEED AVAILABLE FOR DISTRIBUTION.

I. Thomas, Superintendent of Wheat Farming.

As in past years the Department is again this year making available supplies of pedigree seed, produced at the Agricultural Research Stations for distribution to farmers. It is not suggested that a farmer should obtain all of his seed wheat requirements from the Department, but rather that he should obtain a few bags of pedigree seed and sow this in a plot and then use the grain obtained from this plot for his seed requirements the following year.

The aim of the Department is to supply as many farmers as possible with pedigree seed and thus owing to the fact that some of the varieties may be over applied for, it may be necessary to limit the amount of each variety supplied to any one applicant in order that this object may be obtained.

It is anticipated that this year the following varieties will be available for distribution:—

WHEAT.

Baroota Wonder.—A late maturing variety, resistant to flagsmut, but is liable to rust. This variety is recommended for hay in the better rainfall districts.

Bencubbin.—A midseason maturing variety, resistant to flagsmut, but is very liable to rust and is not recommended for those districts where rust is feared.

Carrabin.—An early maturing variety of high quality grain; resistant to flagsmut and rust escaping.

Comeback.—An early midseason maturing variety of premium milling quality. It is resistant to flagsmut and rust escaping.

Ford.—A midseason maturing variety resistant to flagsmut and rust.

Geeralying.—A very early maturing variety, resistant to flagsmut and rust escaping. It is liable to shed.

Gluyas Early.—An early maturing variety; resistant to rust but liable to flagsmut.

Merredin.—An early maturing variety, susceptible to flagsmut, but rust escaping.

Nabawa.—A midseason maturing variety, resistant to flagsmut and rust. Recommended for those areas where rust is feared.

Noongaar.—A very early maturing variety which is drought resistant, being most suitable for areas having a short growing period and for very late planting in those districts having a better rainfall; resistant to flagsmut and rust escaping.

S.H.J.—An early maturing variety producing a grain of high milling quality. It is resistant to flagsmut and rust.

Sutton.—A late maturing variety, resistant to flagsmut and moderately resistant to rust. This variety is not recommended for areas of low rainfall.

Totadgin.—An early maturing variety; resistant to flagsmut.

OATS.

Algerian.—A late maturing variety. Owing to slow early growth it is not recommended for early green feed.

Burts Early.—An early maturing variety which is especially suitable for hay, silage and early green feed.

Guyra.—A midseason maturing variety mostly favoured for its grain which is large and plump.

Mulga.—An early maturing variety suitable for hay, grain, silage and early green feed; superior to Burt's Early for grain.

Wongan.—A very early maturing variety which was produced at the Wongan Hills Research Station from a cross between Mulga and Burts Early. It has short, strong straw and is suitable for early green feed and grain in the drier areas or for late planting in the wetter districts.

BARLEY.

Atlas.—A six-rowed barley which has been introduced from California; it is also known in this State as Californian Six-Row Barley. In England it is used for malting purposes, but it is not employed for this purpose by local brewers whose technique is based on the use of two-row barleys such as Pryor. It is grown mainly for green feed and is quite equal in this respect to Cape, Bald Skinless or Black Barley, while for grain its yield is superior to Cape.

Applications for pedigree seed should be made *direct* to the Department of Agriculture, Perth.

The seed may be obtained under the Exchange System, which has operated for the past few years, when the farmer has been able to exchange his own f.a.q. wheat for pedigree seed on the following basis:—

4½ bushels f.a.q. wheat for 3 bushels pedigree seed wheat or barley.

3 bushels f.a.q. wheat for 3 bushels pedigree seed oats.

Where the applicant prefers to pay cash for his seed the following prices are charged:—

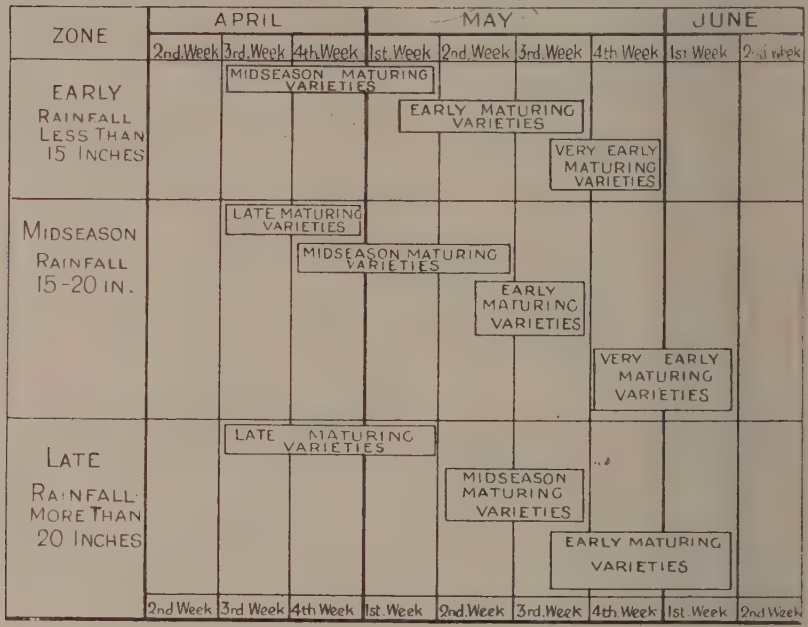
Wheat and barley, 18s. per bag of 3 bushels.

Oats, 12s. per bag of 3 bushels.

Both of these transactions are inclusive of rail freight on the seed to the settler's siding.

Applicants are advised to make early application for their requirements, setting out clearly their name and postal address, together with the siding to which the seed is to be railed.

SEEDING CALENDAR WITH RECOMMENDED VARIETIES FOR THE WESTERN AUSTRALIAN WHEAT BELT.



RECOMMENDED VARIETIES.

Late Maturing.	Midseason Maturing.	Early Maturing.	Very Early Maturing.
Wheat—			
Sutton, Yandilla King, Baroota Wonder (for Hay)	Bencubbin, Ford, Nabawa	Gluyas Early, Merredin, Totadgin	Geeralying, Noongaar.
		Premium Varieties—Carrabin, Comeback, Pusa IV., S.H.J.	
Oats—			
Algerian	Guyra	Burt's Early, Mulga	Wongan.

When planting for hay, sow 7–10 days earlier than for grain.

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The following publications may be obtained from the Department of Agriculture, Perth, on application, or will be sent post free to any address in this State on receipt of a remittance for the amount stated :—

The Management of Poultry under Western Australian Conditions, by W. T. Richardson, Poultry Adviser.

This is a most useful and valuable book, not only for beginners, but to all those who keep fowls for pleasure and profit. It deals fully with all matters connected with the industry, including Breeding, Feeding (for stock birds or egg production), Incubating, Brooding and Care of Chicks, Marketing (eggs and poultry), and all matters of use to the poultry-keeper. It also fully describes symptoms of various ailments and diseases and simple treatment for same, and, as the book was written to suit *local conditions,* every poultry-keeper should have a copy by him. Price, 2s.

The Pruning of Fruit Trees, by J. F. Moody, Fruit Industries Commissioner :
This publication contains numerous illustrations, being reproduction of photographs taken in this State, of pruned and unpruned trees, which make the details set out in the letterpress particularly easy to understand. Price 2s. 6d.

Fruit Packing and the Marketing and Exporting of Fruit, by J. F. Moody, Fruit Industries Commissioner, and J. Ramage, Packing Instructor.
This publication contains invaluable information on packing and grading fruit for local and export markets. It is freely illustrated, and no fruit-packing shed should be without a copy. Price 1s. 6d.

Butter Fat Tables, by the Department of Agriculture, Dairy Branch.
This publication shows the pounds of Butter Fat in various weights of milk tested by the Babcock Method. It is of value to all who have to assess Butter Fat, and is a handy ready reckoner for this purpose. Price 1s.